Railway Engineering and Maintenance

APRIL, 1949

The designing and building of such structures as this famous Pecos River Bridge require great imagination and skill, for they must last practically indefinitely and serve their purpose unfailingly.

Furthermore—think of the constant maintenance of track over which heavy traffic rolls year in and year out. It is in this ceaseless track maintenance that Improved Hipowers are of such invaluable help.

IMPROVED HIPOWERS
IMPROVE TRACK

NATIONAL LOCK WASHER COMPANY NEWARK, N.J., U.S.A.
A COMPLETE LINE OF HOWARD SPRING WASHERS

Main Line

TO MAINTENANCE ECONOMY

A beautiful stretch of track—a big investment in time and money—well maintained to accommodate heavy, high speed traffic which must continually travel over it in order to pay dividends. The accumulation of small troubles can break down this efficiency and create higher maintenance cost for such track. Some such maintenance troubles can be avoided by using Reliance Hy-Pressure, Hy-Crome Spring Washers for track joint bolts. Their reactive pressure keeps bolts TIGHTER LONGER.

Edgemark of Quality

Reliance HY-PRESSURE HY-CROME *spring washers*

RELIANCE DIVISION
Offices and plant: MASSILLON, OHIO

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EATON
EATON MANUFACTURING COMPANY

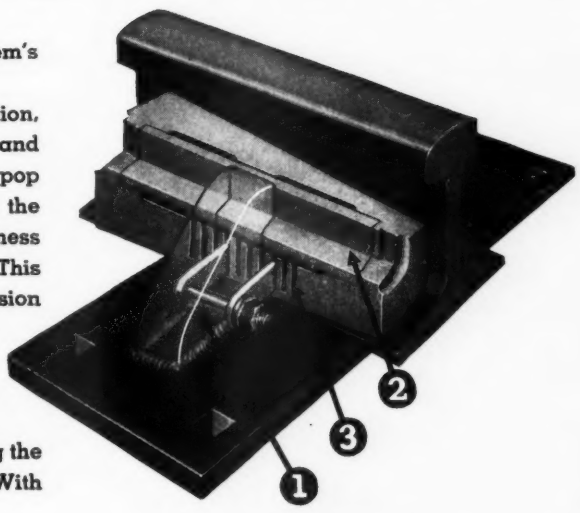
Made to STAY PUT

Service shocks just can't loosen its grip. Bethlehem's 811 Rail Brace is made to stay put—and it *stays*.

If you'll look carefully at the phantom illustration, you'll see why. The 811 uses the wedge principle, and here is a wedge that simply cannot "back up" or pop out of place. As you drive it between the rail and the brace (1), there's a natural tightening effect—a tightness that's increased by an integral steel spring (2). This forged-steel spring member will withstand a compression force of at least 20,000 lb. The farther in you drive the wedge, the snugger the fit.

But there's an added protective feature that eliminates any possibility of loosening. See those two forged pawls? They turn down into the slots (3), locking the wedge—so that it can't slip or be jolted out of place. With the pawls down, you're all set.

We don't know any other rail brace that's so positive; so completely effective. It will take the most vicious thrust that modern high-speed trains can offer. If you would like to see how it works, ask a Bethlehem man to demonstrate under actual traffic conditions.



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On the Pacific Coast Bethlehem products are sold by
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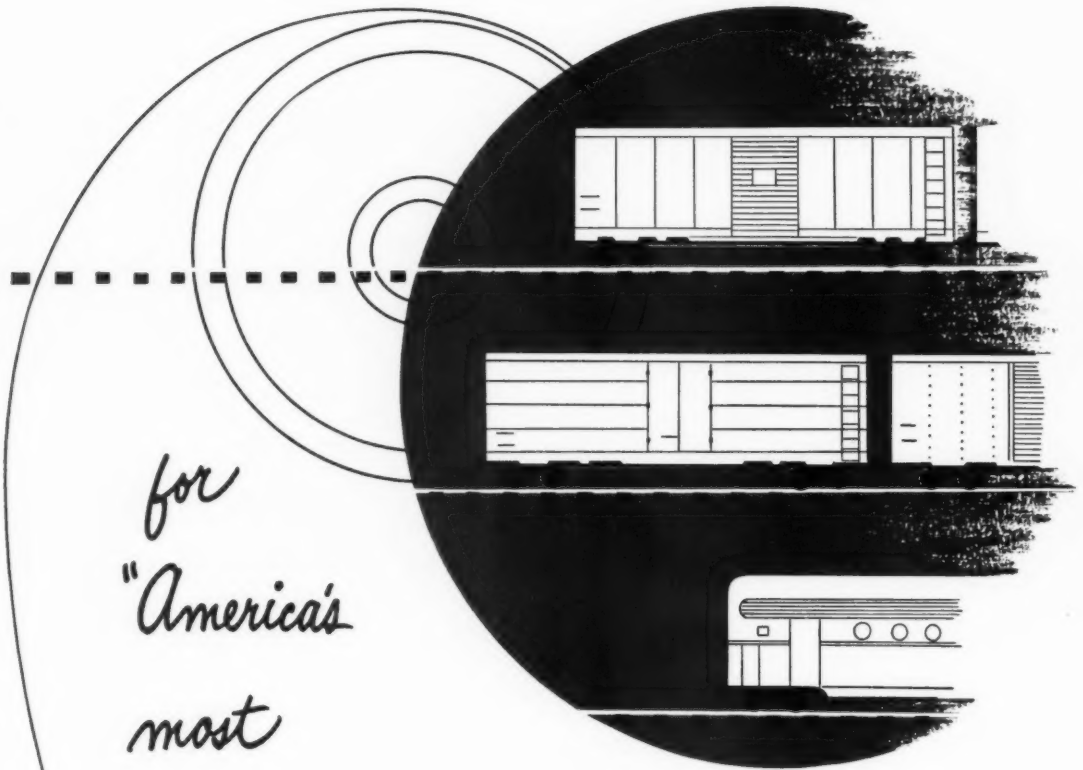
BETHLEHEM STEEL

Bethlehem 811 Rail Brace

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00 for one year; $3.00 for two years. Single copies 50 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.



for "America's most popular cars" specify

penta chlorophenol — *treated Cross ties!*

Railroad men, above all others, should appreciate the advantages of PENTAchlorophenol-treated ties. "PENTA"- protected ties can be counted on—they're *dependable.*

The scientific treatment of cross ties with "Penta" means effective protection against termites and decay, longer tie life, and decreased upkeep and replacement costs. "Penta's" deep penetration and low volatility assure protection that lasts through the years, even under the severest climatic conditions.

Specify the "Penta" treatment for safeguarding your cross ties and poles . . . as well as sheds, platforms and other wood construction. For further information about PENTAchlorophenol write Dow, Dept. PE 44.

DOW penta- chlorophenol

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

On jobs like this NORTHWEST ADVANTAGES MEAN MONEY!

ou have miles of work like this! — Work here the machine is on its own far from ources of attention. It is the kind of a spot where mechanical grief of any kind is a partic- ular headache.

These are the places where Northwest advantages mean money. Northwest Crawlers on such jobs as shoulder widening or ditching are capable of miles of travel. The "Feather-Touch" Clutch Control assures ease of operation without complications and without being affected by temperature or weather.

Your Northwest can't be shut down because of control failure. Ease of convertibility saves time and equips you for Shovel, Crane, Dragline or Pullshovel service with the minimum of equipment.

These are but a few of the advantages of a Northwest. Check into them. Railway service requires the best for those *Key Spots*. Why not plan ahead to have a Northwest on your section.

NORTHWEST ENGINEERING COMPANY
1513 Field Bldg., 135 South LaSalle St., Chicago 3, Illinois

- "Feather-Touch" Clutch Control for easy operation.
- Simplicity of design for easy maintenance.
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- All High-Speed Shafts on Ball or Roller Bearings assure minimum loss to friction.
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- Northwest Dual Independent Shovel Crowd utilizes force other shovels waste.
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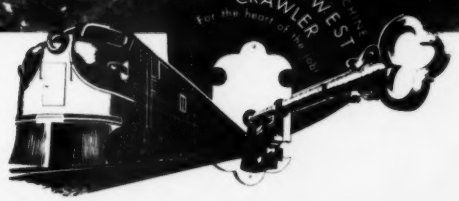
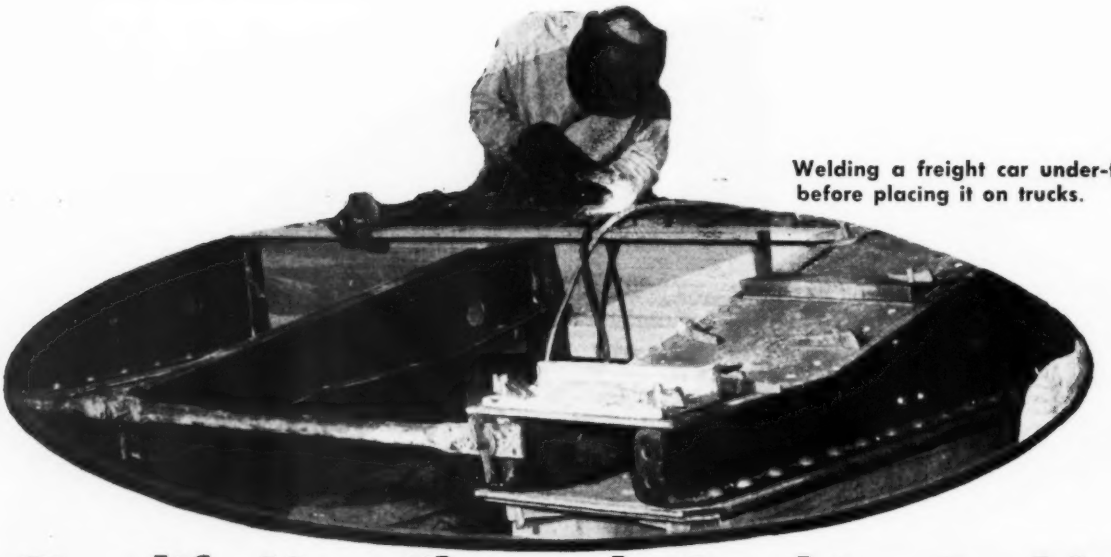
These and other Northwest advantages mean increased output and greater dependability in the Key Spots.

MAKE YOUR KEY MACHINE A NORTHWEST CRAWLER
For the heart of the job

NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL





Welding a freight car under-frame before placing it on trucks.

Simplify Your Electrode Stocking Problem, Reduce Your Welding Costs

Do 90% of your welding with P&H "PF" and "DH2" electrodes

These 2 multi-purpose electrodes can speed up your maintenance and car-building programs. Chances for error are eliminated. No special procedures are required. Ample stocks are easy to maintain.

"PF" (Class E-6012) makes easy work of welding irregular and poor-fit-up joints — it solidifies rapidly. Also use this versatile electrode for good results on sheet metal and on mild steel whenever high tensile strength is desired.

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For special welding jobs on-hard-to-weld steels, call for P&H 70LA (Class E-7015) — it's an all-position, low-hydrogen electrode that produces trouble-free welds of high tensile strength. P&H also offers: A complete line of hard-surfacing electrodes with Rockwell C hardness from 40 to 63. Electrodes for welding high-carbon, alloy, or stainless steels. Nicast electrodes for making machinable welds on cast iron without the need of preheating.

Standardizing on P&H electrodes keeps your welding costs down. Consult a P&H railroad welding specialist or write us for information.

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TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

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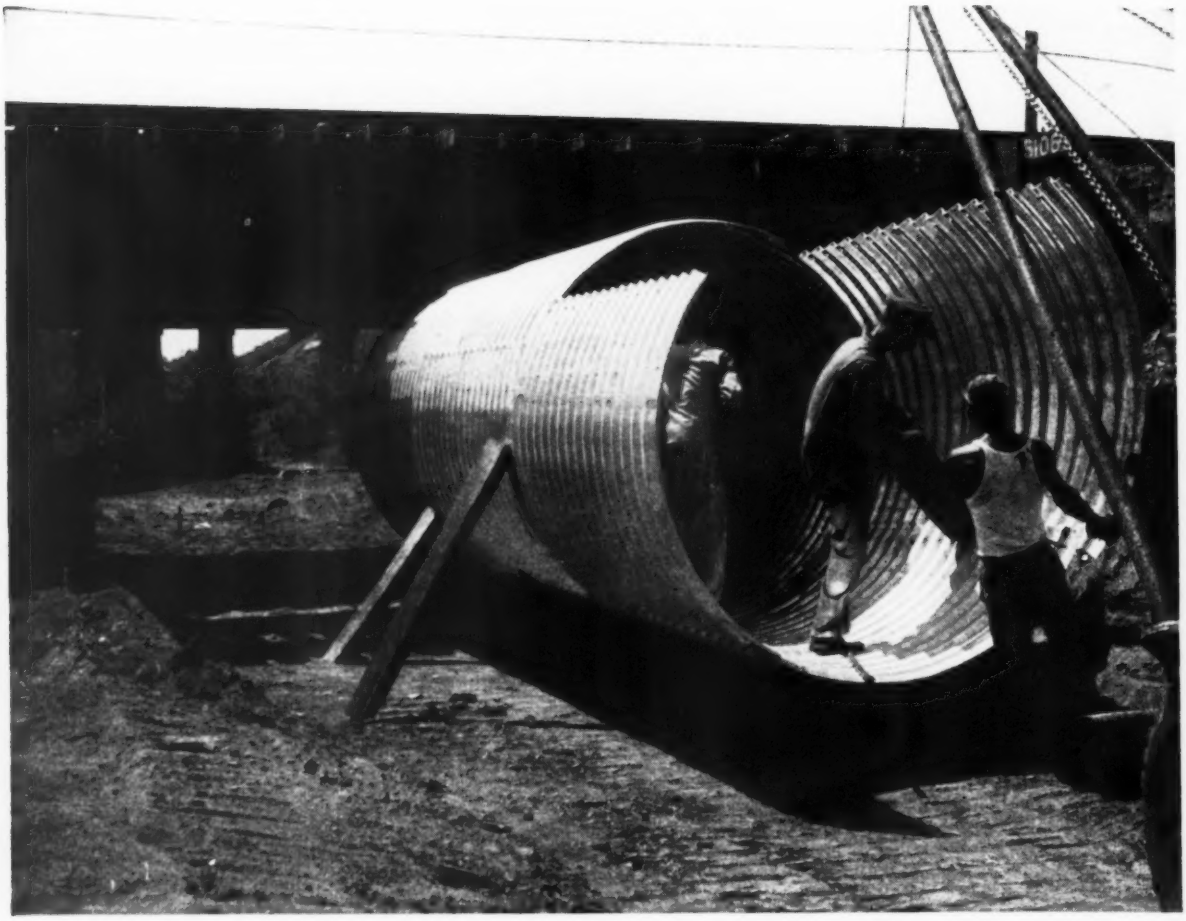

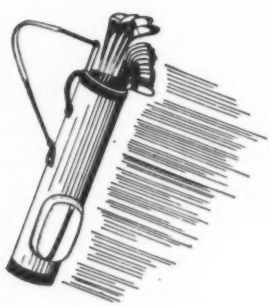

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"Matched Clubs" mean better results for the golfer. In drainage, your "matched set" of ARMCO Corrugated Metal Structures means you get exactly the right structure to do the job. Here's how it works to save you time, money and labor.

You choose plain, Galvanized ARMCO Corrugated Metal Pipe for normal service, ASBESTOS-BONDED Pipe to check severe corrosion, or PAVED-INVERT Pipe whenever erosion is the problem.

For large structures, such as stream enclosures or small bridges, there is ARMCO MULTI-PLATE Pipe or Arches. These are shipped to the site "knocked down" ready for quick, easy field assembly. If headroom is limited, either a plain corrugated PIPE-ARCH or MULTI-PLATE PIPE-ARCH will save raising the grade or installing costly multiple openings.

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SAVES
✓TIME
✓LABOR
✓MONEY

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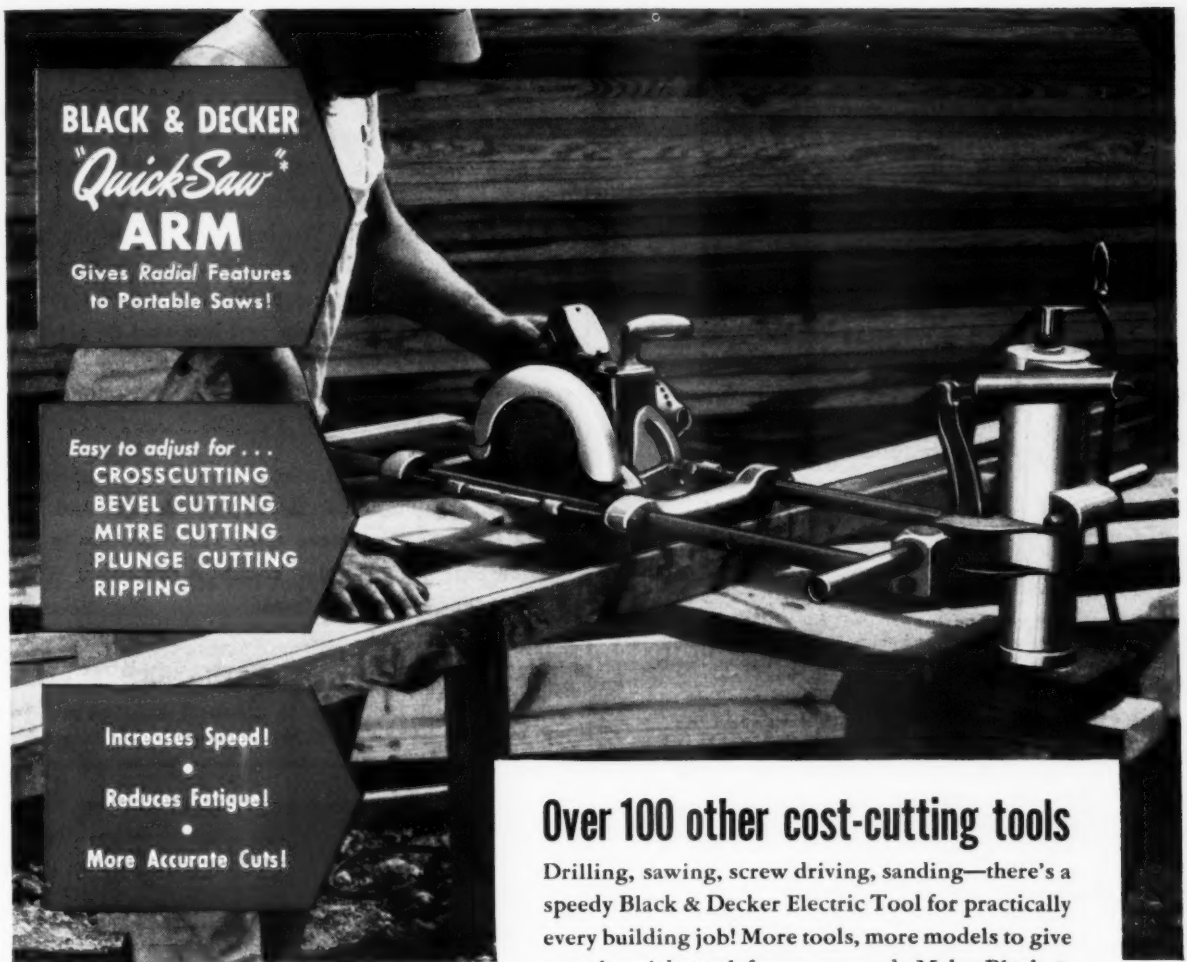

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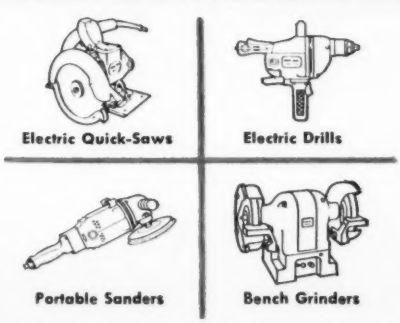

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PORTABLE ELECTRIC TOOLS

Kill Weeds at low cost . . . .

WITH WOOLERY

Weed Burners and Sprayers

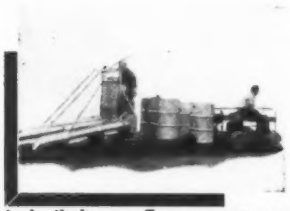
Manufacturers of railway maintenance equipment since 1917

WOOLERY

PB-S WEED BURNER

3 burner type to be pulled by motor car. Burns 15 foot swath first trip . . . burner arms swing out to 25 feet on second trip. Electrically ignited burner arms controlled from cab. Two man operated . . . burns ***all*** types of weeds.

WRITE FOR ADDITIONAL INFORMATION



WOOLERY

PB-B WEED BURNER

3 burner type. Mounted on all steel trailer pulled with motor car. Space for 4-55 gal. fuel oil drums. Two operators required. Burns 15 ft. swath first trip, up to 25 feet by making second trip. Ideal small type weed burner for ***all*** kinds of weeds.

WRITE FOR BULLETIN NO. 170

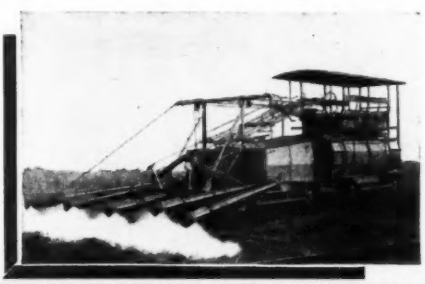
WOOLERY Weed burners control weeds fast, efficiently and at low cost. Seven standard models of open flame type weed burners available from 1 to 5 burners and combination chemical sprayer and weed burner. Woolery also presents a complete line of equipment to provide modern time saving methods of roadway maintenance. Flangeway cleaners . . . tie cutters for fast low cost tie replacement . . . joint oilers . . . tie plate spacers . . . extinguisher cars and creosote sprayers.

Over thirty years railroad men have acclaimed WOOLERY equipment for rugged design and efficient service. Now more than 125 railroads in the United States and foreign countries are using Woolery equipment on their lines.

WRITE FOR COMPLETE ILLUSTRATED BULLETINS

WOOLERY COMBINATION SPRAYER & WEED BURNER

permits chemical spraying or burning weeds as desired. Spray width of 18 feet for chemical sprayer. Regular P.B. burning unit at opposite end. **BULLETIN No. 174.**



WOOLERY GIANT OCTOPUS WEED BURNER MODEL WBZ

5 burner type destroys a swath of weeds 25 feet wide one trip or 35 feet by making second trip. All burners controlled from operator's seat. **BULLETIN No. 169.**

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

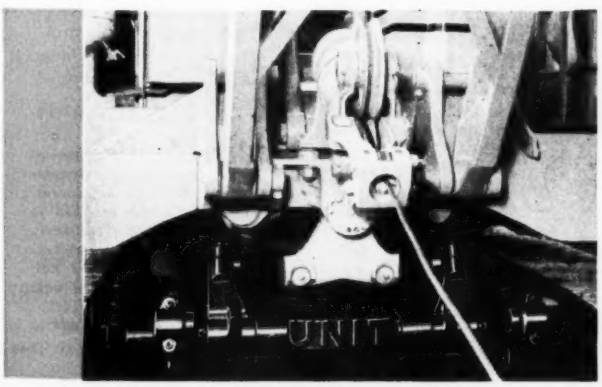
STREAMLINED MAINTENANCE . . . with the NEW UNIT RAILROAD CRANE

- Swing-Limit Stops
- Low Overall Height
- Tapered Counterweight
- Narrow Gauge Crawlers
- Short Tail Swing

Many of the features found in the UNIT 817R were built around the ideas and suggestions of railroad engineering specialists. Its modern design assures fast, easy control, both in crane and excavator operation . . . on the line, or off-the-track. A low overall height allows for underpass clearance. Narrow gauge crawlers permit unloading in, and moving through, narrow gondolas. A tapered counterweight, combined with swing limit stops, for track clearance.

With a reputation for high production and economical operation, the UNIT 817R is a machine you'll want to know more about . . . Write for complete details regarding specifications and working ranges.

UNIT CRANE & SHOVEL CORP.
6403 W. BURNHAM ST., MILWAUKEE 14, WIS. U. S. A.



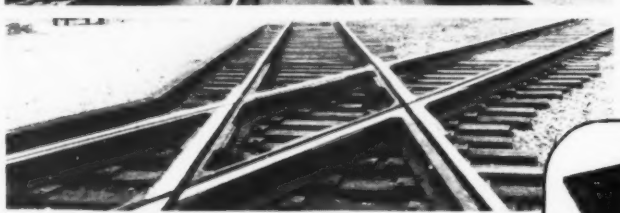
Swing-Limit Stops act as automatic guides where space does not permit a full swing. Eight cushioned stops offer a selection of working ranges within safe operating limits. This important safety feature prevents fouling the adjoining track or striking obstacles when working in confined quarters.

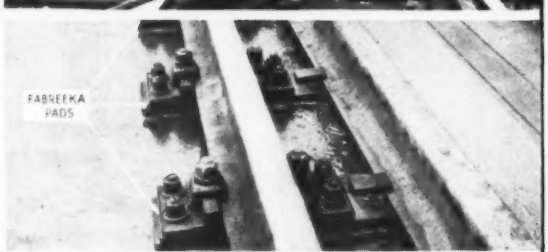
SHOVELS • DRAGLINES • CLAMSHELLS • CRANES • TRENCHOES • MAGNETS

FABREEKA

ABSORBS IMPACT SHOCK AND VIBRATION ON BRIDGES, CURVES, SWITCHES, AND TURNTABLES

The physical properties of Fabreeka, — great strength; minimum permanent set; controlled resiliency; high damping value and long life make Fabreeka the ideal material for use beneath crossings, cross-overs, and switches; on curves; in turntables; and on steel and concrete deck bridges.





At *crossings, cross-overs,* and *switches* Fabreeka pads between ties and tie plates increase the life of manganese points by cushioning impact blows from the wheels. Fabreeka's slow recoil from "compression" insures cushioning without bounce. Mechanical wear of ties is also reduced.

On *curves,* the mechanical wear on ties from plate cutting is eliminated. The frequency and expense of regauging track is greatly reduced. Fabreeka pads keep spikes from lifting.

In *turntables,* Fabreeka reduces impacts through application under end tie plates; under end tie plates of approach tracks; over bearings of turntable trucks; and under tie plates of circular rail.

***Used between the rail and the steel or concrete deck of bridges,* Fabreeka eliminates the use of ties and ballast. This reduces the foundation depth required, yet leaves proper clearance for underpass, and yields sizeable savings in excavating and concrete work.**

FABREEKA PRODUCTS COMPANY, INC.
222M SUMMER STREET
BOSTON 10, MASSACHUSETTS

IT PAYS

to Specify Fabreeka

FABCO TIE PADS

For Open Track

Fabco Tie Pads reduce the mechanical wear of ties, and are especially recommended for use on ties in curves, bridges, and switches where tie life is relatively short and the cost of renewal, high. Withstand extreme temperatures, moisture, mildew, sand. Spikes do not have to be driven down a second and third time.

Longer Tie Life with Fabco Tie Pads
- resilient
- no set — no loose spikes
- no renewals required

Made By The Makers of Fabreeka

Safeguard Rail Travel with PITTSBURGH SNOLITE White Paint

(Fume-Proof)

Whiter Initially—Stays White Longer

. . . for signs, crossing gates, fences, and cattle guards

TODAY'S schedules require that all types of signs be maintained at new standards for safer operation at higher speeds.

Pittsburgh provides a white finish for this purpose that is whiter initially and provides higher visibility. SNOLITE is a fume-proof durable coating for signs, crossing gates, fences, cattle guards, etc.

SNOLITE dries to a smooth surface of superior whiteness which eventually chalks instead of checking or cracking. Industrial gases and smoke fumes will not darken or discolor it.

Write today for Pittsburgh's new booklet of Railway Structural Finishes. It may help to save you time and money.

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Industrial Paint Division, Pittsburgh, Pa.
Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Houston, Texas; Los Angeles, Calif.; Portland, Ore. Ditzler Color Division, Detroit, Mich. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Division, Cleveland, Ohio. M. B. Suydam Division, Pittsburgh, Pa.

PITTSBURGH PAINTS

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PITTSBURGH PLATE GLASS COMPANY

Main-Line Main- -tenance is Easier With

Simplify and Speed-up your earth-moving or material handling operations by giving such work to a Link-Belt Speeder shovel-crane —Crawler-mounted off-the-track equipment is the logical choice for this type of work, as it is easily maneuvered into its most favorable operating position, and continues to work regardless of traffic on the rails.

Railway men appreciate the clean cut design of Link-Belt Speeder machines, which are engineered for long life, trouble-free operation, high productivity and minimum upkeep. Quick convertibility from one front end attachment to another gives high utility to this rugged machine, which is a shovel on one job, a dragline, clamshell or pile-driver on another job, or a trench-hoe on a still different job.

The Link-Belt Speeder does MORE WORK, MORE KINDS of work, MORE OF THE TIME!

Link-Belt Speeder Model LS-50 equipped as a drag-line, excavating ditches and loading gondolas on the right-of-way improvement program of a prominent western line.

10,540

Ask for illustrated bulletin on the "CARGOCRANE" the Wheel-mounted Yard Crane.

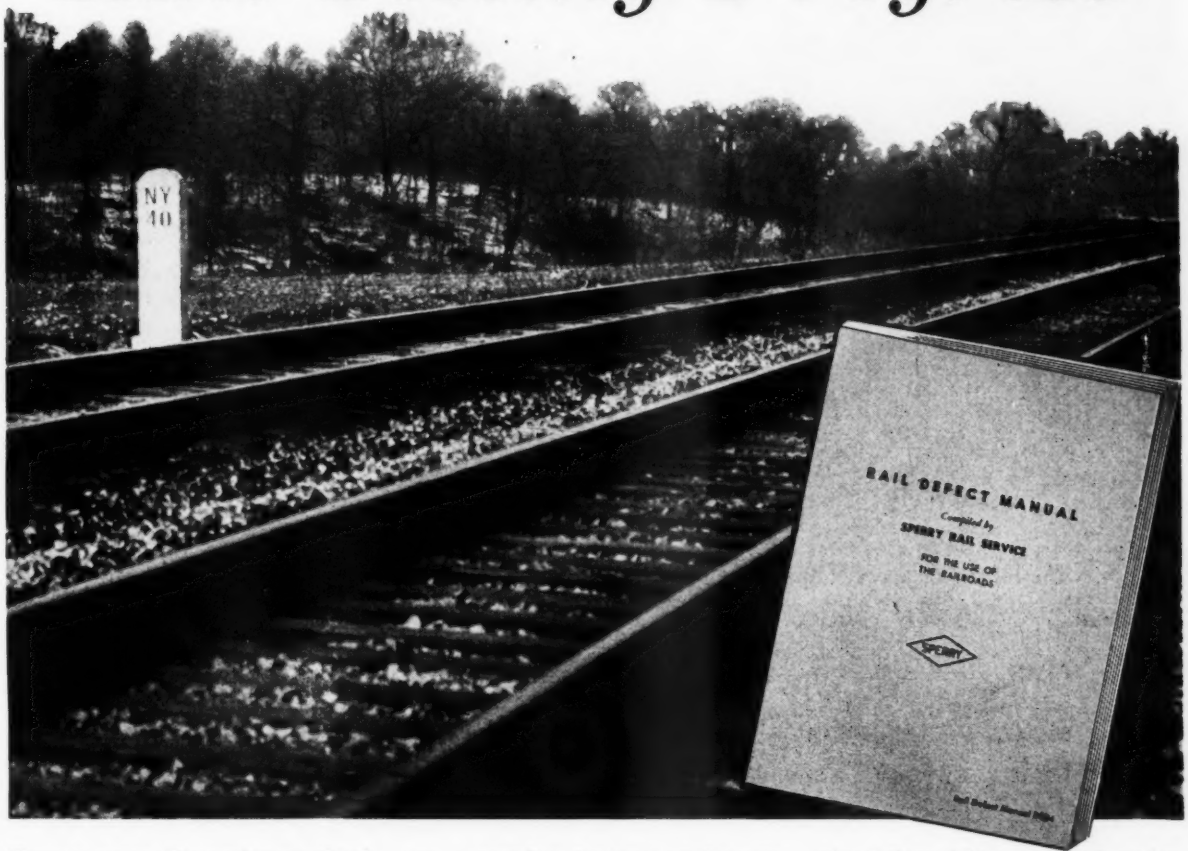
LINK-BELT SPEEDER

LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS, IOWA

Builders of the Most Complete Line of SHOVELS-CRANES-DRAGLINES

*How Sperry Service Contributes to Railroad Safety

ANOTHER MILEPOST IN *Rail Testing Progress*



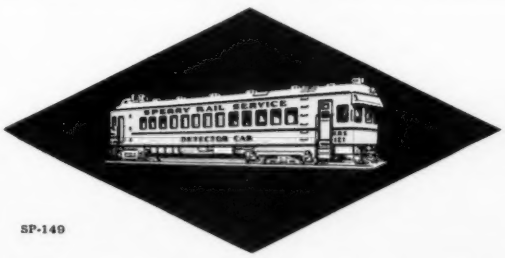
Twenty years of experience gained from testing two million miles of rail in track—data compiled from one million defects found by Sperry Detector Cars—all are contained in a brand-new handbook with a familiar title—the Fourth Edition of the Sperry *Rail Defect Manual.*

Long a standard reference of track personnel, the *Rail Defect Manual* is the only comprehensive handbook of up-to-date information on the occurrence and classification of rail defects. It is published as a regular feature of Sperry Service.

The *Rail Defect Manual* is one of many exclusive Sperry activities which go far beyond the actual locating of defects in track. These include a continuing program of research and development of new equipment, centralized quality control of each test, compilation of testing statistics, publication of the only journal devoted to rail testing — the "Sperry Review," instruction and data sheets, service-failure follow-up, and active participation in rail-breaking programs.

Each one of these activities is an important part of the Sperry testing program. Together, they contribute to the twenty-year Sperry record of finding *more* and *smaller* transverse defects, as well as more longitudinal defects than any other method of testing rail in track.

The *Rail Defect Manual* will be mailed to railroad executives upon request. Write for your copy today.

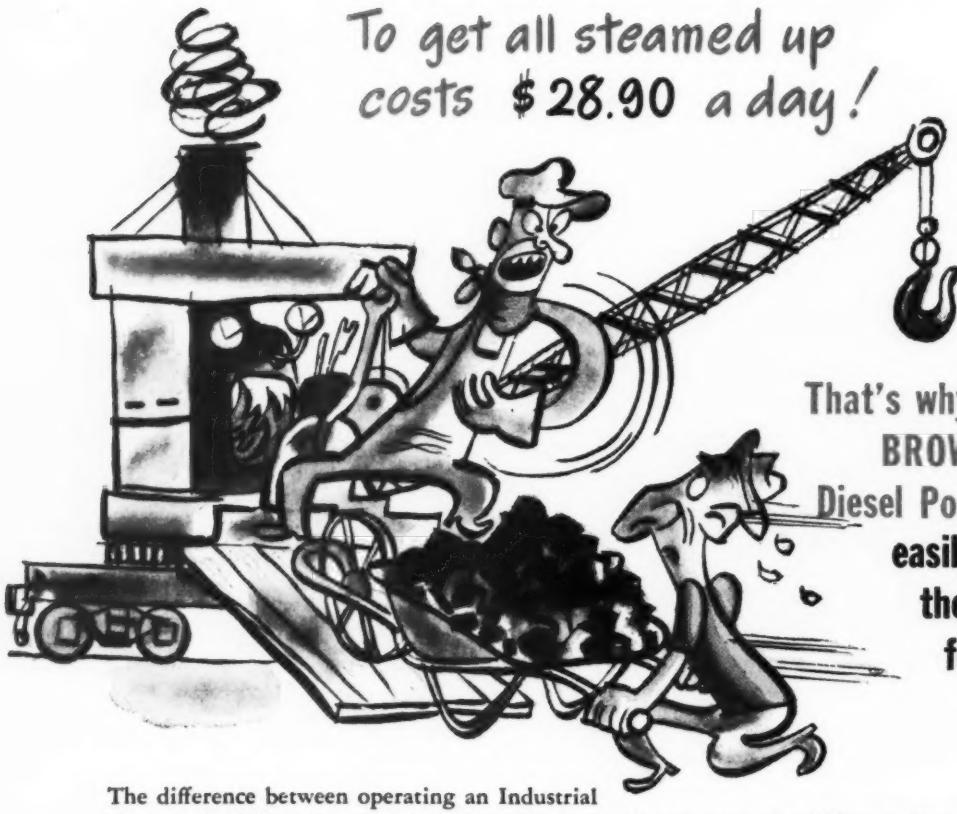


SP-149

SPERRY RAIL SERVICE

Division of Sperry Products, Inc.

DANBURY, CONN.



That's why INDUSTRIAL BROWNHOIST Diesel Powered Cranes easily pay for themselves in four years.

The difference between operating an Industrial Brownhoist Diesel Crane and a steam-operated unit can mean the difference between profit and loss. Look at these typical figures:

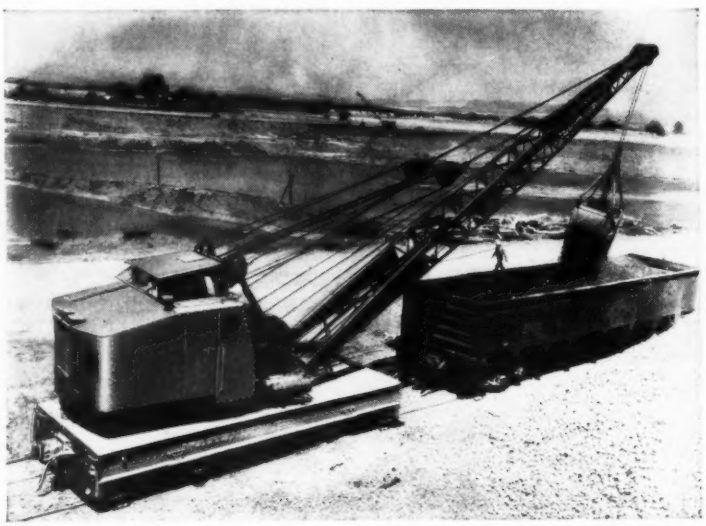
SAVINGS IN FUEL PER DAY	$13.40	(Based on 1½ tons coal per day at $10 a ton, against 16 gallons of fuel oil at 10c a gallon.)
SAVINGS IN LABOR PER DAY	$15.50	(Unproductive firing, banking, cleaning time — 2 hours for engineer at $1.75 per hour, and 8 hours fireman at $1.50 per hour.)
TOTAL FUEL AND LABOR SAVINGS PER YEAR	$7,514.00	

PLUS 65 ADDITIONAL OPERATING DAYS A YEAR!

It takes two hours a day on the average for firing, banking, taking coal and water, boiler washouts, etc. That totals 10 hours weekly, 520 hours annually—or 65 extra days of productive crane time per year.

AND THESE ADVANTAGES:

Safer, cleaner operation; greater production and less operator fatigue because of 360° visibility from monitor-type cab and air operated controls; reduced maintenance time —about half that of steam; elimination of smoke nuisance and fire hazard. Write for complete information.



BROWNHOIST *BUILDS BETTER CRANES . . . with Diesel power*

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICH. • **DISTRICT OFFICES:** NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO • **AGENCIES:** DETROIT, BIRMINGHAM, HOUSTON, LOS ANGELES, PORTLAND, SAN FRANCISCO, SEATTLE, SPOKANE, CANADIAN BROWNHOIST LTD., MONTREAL, QUEBEC.

What's the best way...

to cut rail cropping costs

by portable field units? ...or fixed installation?

Both are excellent!... but, many roads find that a centrally located rail cropping plant usually lends itself to a more efficient and economical operation.

With a fixed installation, the work can be set up on a continuous production basis... rails can be collected at a central point, and the road can realize the full capabilities of specialized workmen.

As shown in the accompanying photographs, rail cropping is simple, easy and quick. The Airco developed rail cropping machine employs two highly efficient, oxyacetylene flame cutting tips, which cut rails of any size, making as many as 25 cuts an hour, and producing a surface that requires a minimum of grinding.

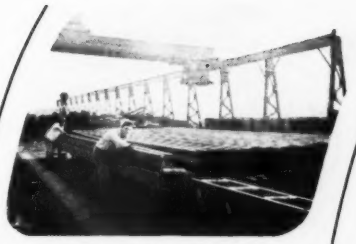
For further information, write your nearest Airco office. (In Texas: Magnolia Airco Gas Products Company. On West Coast: Air Reduction Pacific Company.)

COSTS COME DOWN UNDER THE AIRCO PLAN

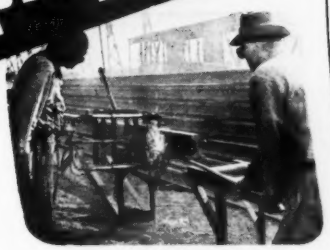
AIRCO **AIR REDUCTION**

Offices in Principal Cities

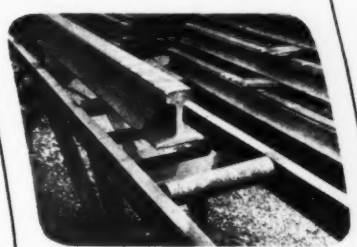
Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories.



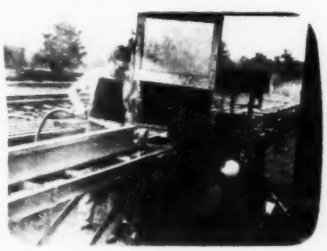
. . . conveying the rail to the cropping machine.



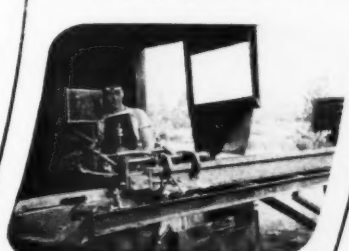
. . . making the bottom, or backward, cut. (Note: This machine is portable and can be transported to the right-of-way, if so desired.)



. . . cropped rail, showing cut quality.



. . . finishing the cut end.



. . . drilling bolt holes in rail end.

the NORDBERG RAIL DRILL

LOOK AT THESE FEATURES:

★ **EASILY SET UP**
No part of machine rests on ties or ballast. High ballast, ice, snow, or unequal tie level are no problem. Correct drilling location instantly obtained from top of rail.

★ **HEAVY DUTY PERFORMANCE**
Although light in weight, simplicity of design and quality construction make this drill more rugged than heavier models.

★ **LIGHTWEIGHT**
Thru use of aluminum frame and other special design features, total weight is only 132 pounds.

★ **VERSATILE**
14 inch spread permits drilling at switch heels, frogs and guard rails.

★ **CHUCK SIMPLICITY**
No tools required to install or remove bit.

★ **LOW PRICE**
Justifies locating a Nordberg Drill even at points where only occasional holes are drilled.

Investigate your hand drilling costs. Check them against the Nordberg Model CD which drills a 1⅛ inch hole in less than a minute. You just can't *afford* to waste valuable man hours drilling bolt holes in rail by hand methods. Write for Bulletin 157.

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN

R449

NORDBERG TRACK MAINTENANCE MACHINES
ADZING MACHINE • SPIKE PULLER • TRACK WRENCH • SPIKE HAMMER
RAIL DRILL • POWER JACK • CRIBEX • RAIL GRINDER • TRACK SHIFTER

ADDITIONAL INFORMATION

On Any of the Products Mentioned in This Issue

Below is a complete index of the products referred to in both the editorial and advertising pages of this issue. If you desire additional information on any of them, use one of the accompanying addressed and stamped postcards in requesting it. In each case give name of product and page number. The information will come to you directly from the manufacturer involved, without any obligation on your part.

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Do the Job!

CHIPMAN CHEMICAL COMPANY weed killers are backed by thorough experience in weed control... developed over 35 years' service to railroads. This "know how" plus strategic plant locations throughout the country enables us to offer you a complete and convenient weed control service... as well as proven chemicals.

Chipman Spray Train

Push Car Sprayer

Our complete spray trains are available for contract service... where treatment covers extensive mileage. For restricted mileage, a small push car sprayer (usually made by the railroad) is equally practical.

In either case, Chipman proven weed killers combined with proper equipment make for successful weed control. Call on us for advice on both.

CHIPMAN CHEMICAL COMPANY, INC.

Chicago, Ill. **BOUND BROOK, N. J.** Palo Alto, Calif.

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Manufacturers of

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It's your SCRAP for more Steel!

CASE STUDY NO. 1:

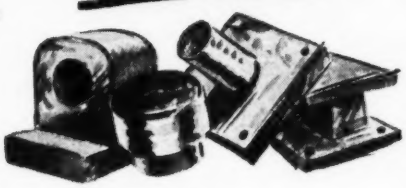
88 Carloads

Here's a photographic equipment manufacturer with a systematic metal-salvage program. No more scrap, they said. Yet, after more careful study, they found 88 carloads of heavy iron and steel scrap in a 30-day period!

CASE STUDY NO. 2:

Metalworking Plant Surprised!

This big fabricator reported all scrap being turned in. When told needed scrap includes old equipment, not just "production" scrap, they uncovered extra tons of iron and steel.



CASE STUDY NO. 3:

Paper Converter Delivers!

This plant replaced 3000 obsolete machines with new ones. Held old ones for occasional spare parts. Changed mind, scrapped 2800, reduced inventory, got high price for scrap.

You, too, may have heavy iron and steel scrap you don't know about. It's the *heavy* scrap that makes the best steel and by processing faster, increases steel output. Appoint one top official of your company to find it. Today, it's dead inventory. Tomorrow, it can be money in the bank. But better than that, it can help to build the one million tons of reserve scrap that we need to increase production for domestic use and for security purposes. Remember—scrap reserves are low, the price of steel scrap is high. Help America and yourself by putting your scrap back to work.

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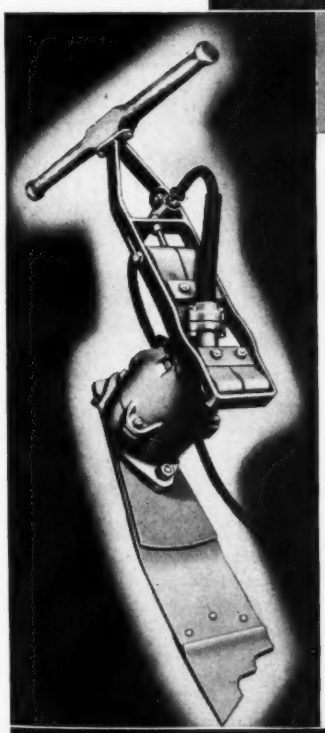
Railway Engineering and Maintenance

JACKSON TAMPERS

are found on the job . . . . .
not in the toolhouse

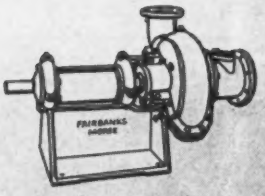
The 4-Tamper Outfit, consisting of 4 Jackson Tampers and our M-2 Power Plant, which is ideal for section gangs, is also unsurpassed when grouped in extra-gang service.



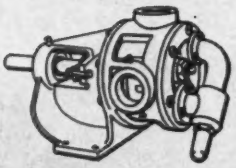
CHECK with any of the scores of roads using Jackson vibratory tie tampers and power plants and you will find that this equipment is in almost constant use. One reason is its outstanding reliability. "Absenteeism" for repairs or "tinkering" is virtually a negligible quantity. Another is, that with their 3 quickly interchangeable blades, they are so highly efficient in every operation for which tampers can be used — so universally applicable to all types of section and extra-gang service — that they are in constant demand.

We are confident we can prove to your entire satisfaction, that for the all-over job of track maintenance, Jackson vibratory tie tampers and power plants offer many advantages over any other type of manually guided mechanical tampers. Let us tell you more about them. Write for bulletin "JT-1048".

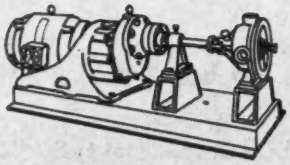
ELECTRIC TAMPER & EQUIPMENT CO. Ludington, Michigan



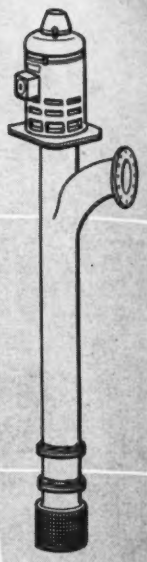
Paper Stock Pumps



Frame Constructed Rotary Pumps

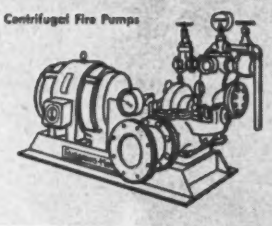


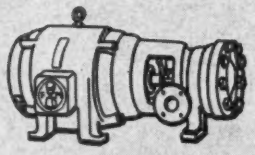
Rotary Pumps with Geared Head Motor Drive



Vertical Propeller Pumps

Centrifugal Fire Pumps





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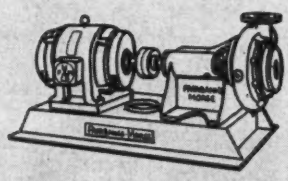
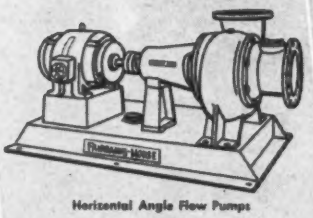


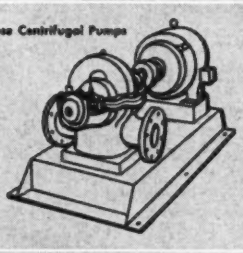
Horizontal Sewage and Trash Pumps

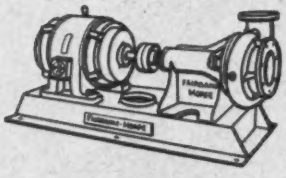


Horizontal Angle Flow Pumps

Vertical Close-Coupled Sewage and Trash Pumps

Split-Case Centrifugal Pumps

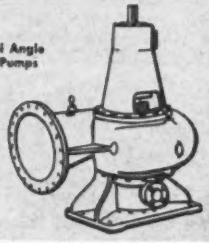


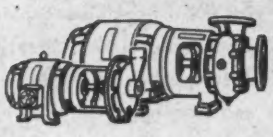


Base-Mounted Centrifugal Pumps

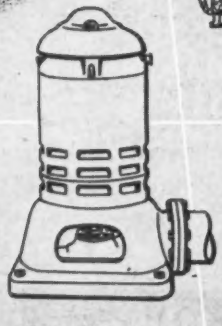
Vertical Sewage and Trash Pumps

Vertical Angle Flow Pumps

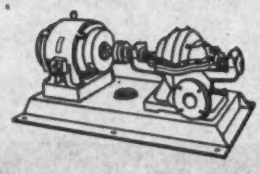




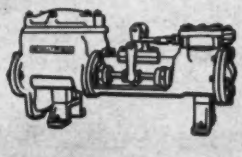
Builtogether Centrifugal Pumps



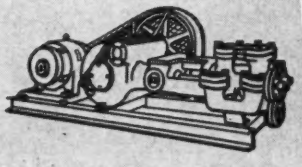
Deep Well Turbine Pumps



Two-Stage Centrifugal Pumps



Duplex Steam Pumps



8 Cover Side-Pot Duplex Power Pumps

for Pumps...

THAT DELIVER

plus performance
lasting dependability
unsurpassed economy

The benefits of using Fairbanks-Morse as the single source for pumps for every water-moving application are well known to railroads the world over. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES
MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS
and STANDPIPES • FARM EQUIPMENT • MAGNETOS

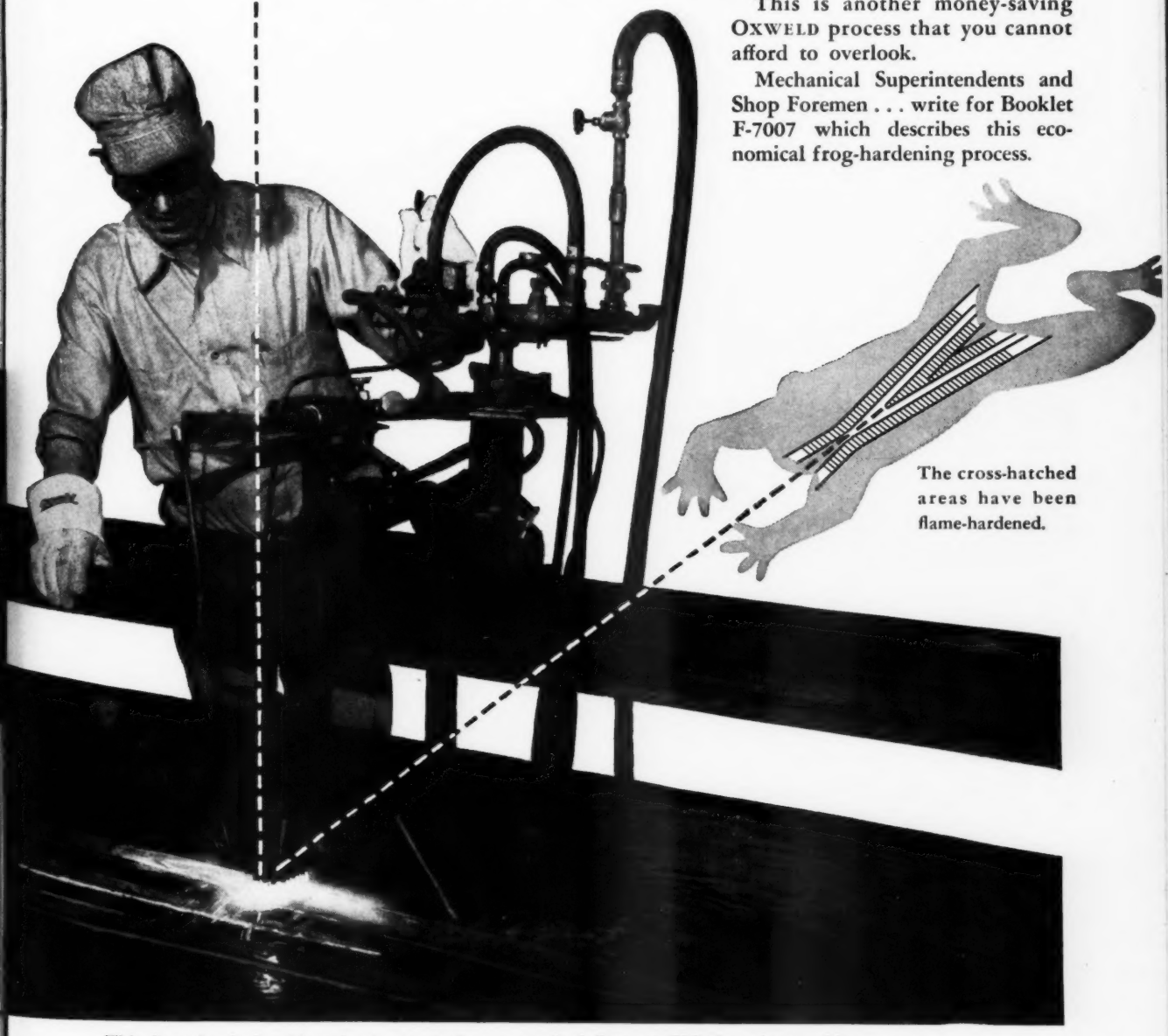
FROGS can have 9 lives too

When carbon steel frogs are oxy-acetylene flame-hardened, their running surfaces will last up to nine times as long as untreated frogs.

This recently developed OXWELD method is simple and economical. A single multiflame heating head is used—no extra heating is required to draw or temper the hardened areas, and no special coolants are needed. Treated surfaces have uniform hardness values, correct hardness depth.

This is another money-saving OXWELD process that you cannot afford to overlook.

Mechanical Superintendents and Shop Foremen . . . write for Booklet F-7007 which describes this economical frog-hardening process.



The cross-hatched areas have been flame-hardened.

This flame-hardening blowpipe is mounted on a standard OXWELD CM-16 cutting machine.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

Carbide and Carbon Building Chicago and New York

In Canada:

Canadian Railroad Service Company, Limited, Toronto

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P-21650

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

QUALITY CONCRETE
for enduring, economical structures

HIGH BRIDGES like this one on the Kansas City Southern Railway near Kansas City are especially vulnerable to the destructive forces of weathering. Yet this concrete arch bridge has suffered little from more than 20 years of continuous exposure to wind, rain, snow, sleet, heat, cold and frequent freezing and thawing cycles.

Such resistance to weathering is typical of quality concrete construction. Concrete structures can be designed to withstand any natural wearing action—underwater, underground or in the atmosphere.

In the long run durable construction is the most economical too. Structures that resist weathering last longer and need less maintenance. That's why concrete is ***low-annual-cost*** construction.

Durable, economical structures are the result of applying proven principles and procedures of quality concrete construction. These principles and procedures are fully described in a new 70-page illustrated book, "*Design and Control of Concrete Mixtures.*" Write for your free copy today. It is distributed only in the United States and Canada.

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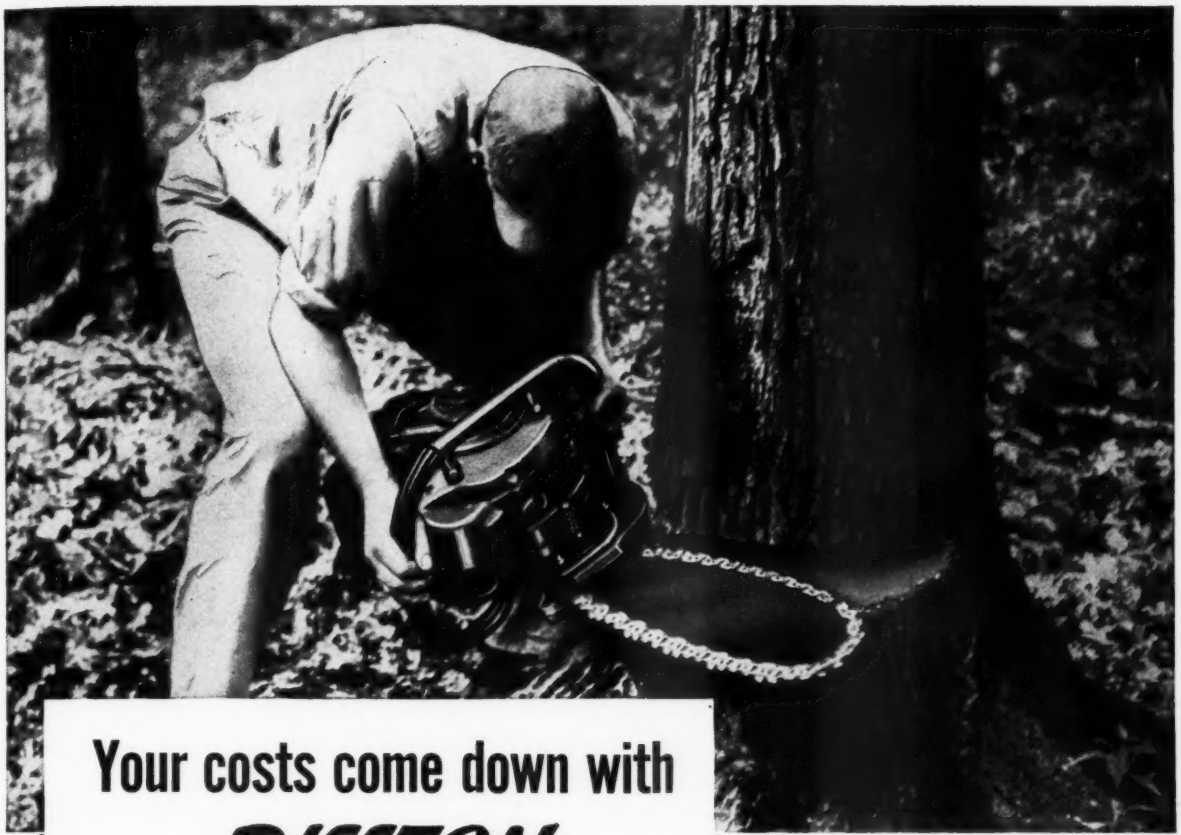

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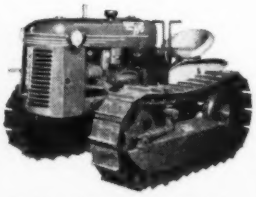
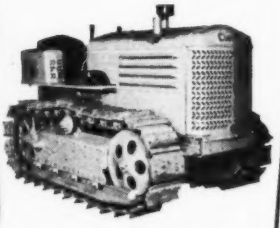


OLIVER-Cletrac Model HG



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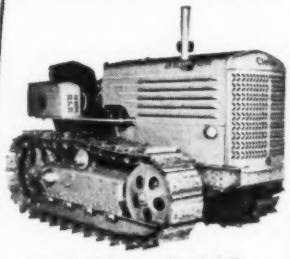

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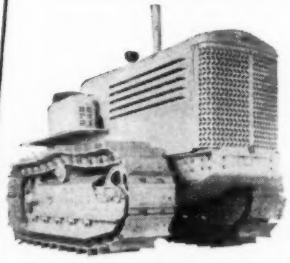

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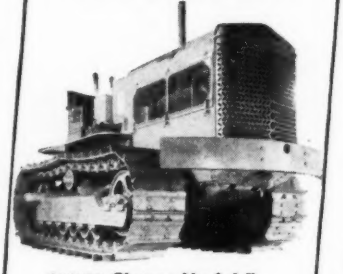

OLIVER-Cletrac Model F

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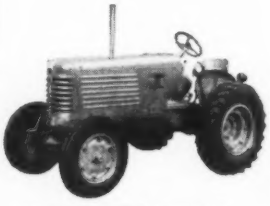
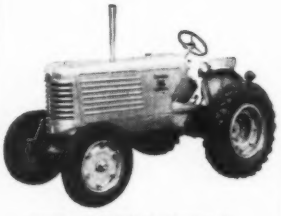
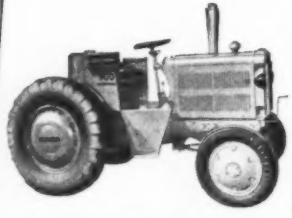


OLIVER "77" Industrial



OLIVER "88" Industrial



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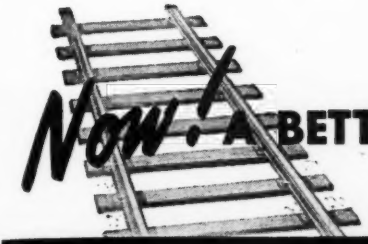

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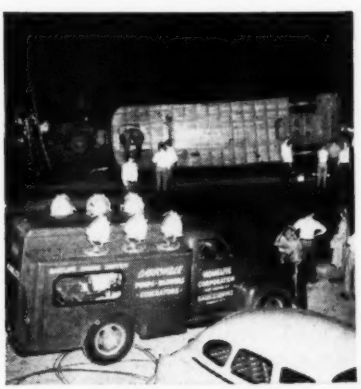

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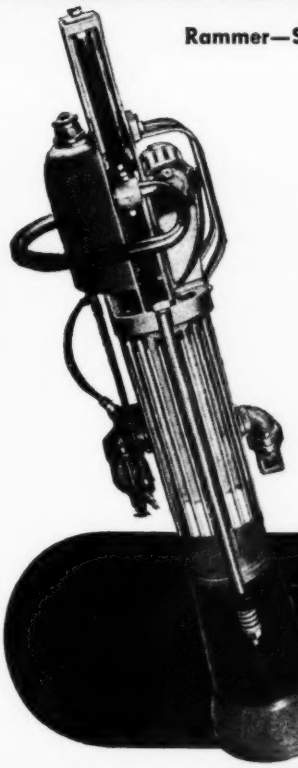

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No. 244 of a Series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION 105 WEST ADAMS ST. CHICAGO 3, ILL.

Subject: Another Help For You

April 1, 1949

Dear Readers:

With considerable pride, I direct your attention this month to a few interesting facts about the new 1948 edition of Railway Engineering and Maintenance Cyclopedia, only just now being made available generally to the railway field.

Many of you are familiar with the Cyclopedia, since the new volume is the seventh edition and has already had considerable distribution. But for the benefit of any of you who may not be acquainted with this book, I point out that it contains 1220 pages, 8 in. by 11 in., and, like its predecessors over the last 28 years, is offered as an authoritative, up-to-date text and reference on the best practices, materials, equipment, tools and appliances that enter into the construction and maintenance of the fixed properties of the railways.

While the new edition of the Cyclopedia, with its many basic facts, may contain much that is not new to many of you, it is safe to say, I am sure, that it does include a wealth of information with which you are not familiar, especially that with respect to methods and practices outside your immediate specialty. Herein, no doubt, lies its greatest appeal, especially among those who desire to know—or who must know—the essential elements of the operations, practices and equipment that enter into all phases of railway construction and maintenance.

But some of the most interesting things to me about the new Cyclopedia as I look back, as its editor, are the human elements that went into its production. Directly or indirectly the Cyclopedia and almost countless editors and contributors. At work for almost two years, the permanent staff put in more than 21,400 man-hours collecting information and illustrations from some 700 manufacturers and many other sources, in compiling data, revising and enlarging text and catalog pages, and in putting the book through the printshop. And more than 541 man-hours alone went into the compiling of four different indexes designed to make the volume of maximum convenience to users.

Of interest to me too, and an indication of the spirit of the editors, is the fact that included in the total number of man-hours of effort involved were more than 2,230 hours of overtime, freely given largely in order to overcome time lost as the result of labor difficulties in the printing industry, and thus permit getting the book out on schedule.

And did you ever stop to think what it costs to publish such a volume? Carefully kept production records place this cost at nearly $25 per copy—or from three to six times the sale price, depending upon the number of copies ordered. For the fact that this book can be distributed at a price from one-third to one-sixth of its production cost, we are all indebted to the support given to it by nearly 300 manufacturers through their catalog pages.

We of the staff of Railway Engineering and Maintenance are proud of this related publication of our company, are pleased that it can be offered at a reasonable price, and hope that many of you will find it a valuable supplement to your regular monthly issues of our magazine.

Sincerely,

Neal D. Howard
Editor

NDH:ag

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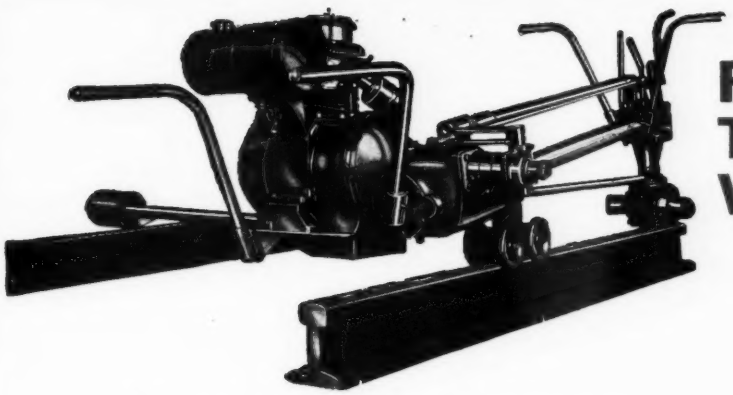

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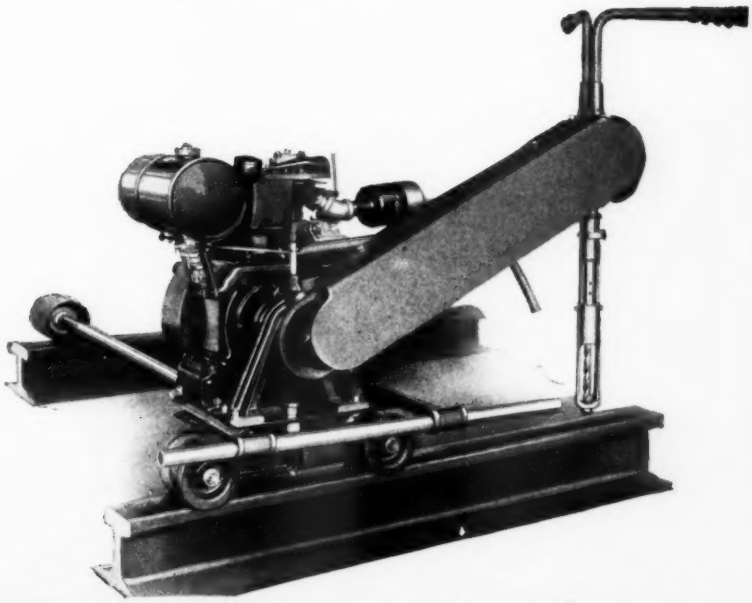

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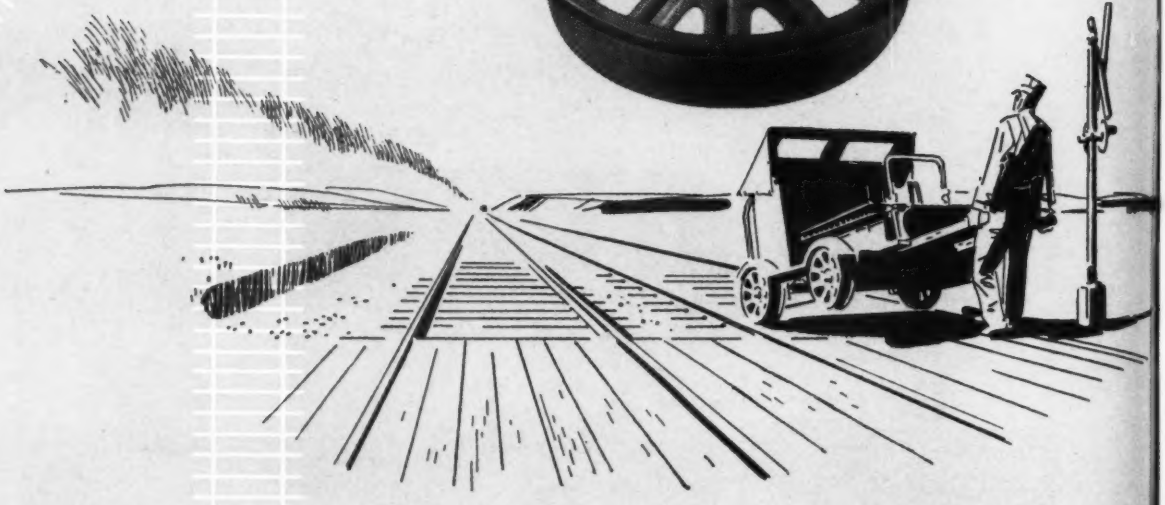

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

VOL. 45, NO. 4 APRIL, 1949

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The 40-Hour Week—

A New Problem, But There Is A Way Out

The railroads are faced with a new dilemma. Effective September 1, nearly 1,000,000 of their non-operating employees, including more than 250,000 in the maintenance-of-way department, will go on a 5-day, 40-hr. work week with no decrease in their present 6-day, 48-hr. pay. Meanwhile, retroactive to October 1, 1948, and hereafter, their rates of pay will be higher by seven cents an hour, bringing their total rate increase, after September 1 next, to an average of approximately 26 per cent. These are the results of an agreement signed by the railroads and sixteen non-operating brotherhoods on March 20, concluding 11 months of negotiations.

This new deal for employees presents the railroads with a dilemma in the fact that while their traffic and earnings are falling, while their subsidized and little-regulated competition reaches new heights, and while their fuel and material costs continue at record levels, they are being called upon under the new agreement to pay out an additional $340,000,000 in wages in 1949, and $640,000,000 additional annually thereafter, based on the November, 1948, level of employment. Unfortunately, the new agreement also presents many employees, regardless of immediate advantages, with a dilemma, because it must be self-evident that, in the long run, they "can't have their cake and eat it too." The end result must be, and assuredly will be in time, fewer employees.

Interesting as were the long and varied presentations in the recent wage and hour dispute, the time is past to discuss or argue the issues involved. Differences must now be buried, and if the greatest good—or should it be said, least harm—is to come from the agreement reached, it is not too early for management and employees to put their heads together in a serious effort to find solutions to the new problems presented. Properly solved, the present dilemma confronting both the roads and their employees could largely disappear. But the adjustments are certain to be painful and to take considerable time.

Looking realistically at the new situation created, at least one thing seems certain. In the face of declining traffic and earnings, the railroads cannot continue indefinitely to enlarge their outgo through increased costs. The alternative for higher labor rates must ultimately mean fewer employed hours at the higher rates, unless there is a sharp upturn in the earnings of the industry, a radical improvement in its competitive position, and a more understanding attitude toward it on the part of government agencies and regulators—all of which seem unlikely at the moment.

The ultimate result of the 40-hour week from the standpoint of the railways will be to reduce the productive working hours of present employees by one-sixth. Obviously, at a time when, according to the Interstate Commerce Commission, there exists $560,000,000 of deferred maintenance in roadway accounts, and further work is being deferred currently, largely because of lower earnings, the answer to the problem presented cannot be found in less productive work—if the roads are to continue to maintain and further improve their position of service and safety.

The only sound answer to the problem, which will be recognized and supported by every alert and fair-minded officer and employee, is for the railroads to build for greater permanence in every element of their fixed properties, thereby avoiding unnecessary man-hours for constant maintenance and frequent renewals, and to increase the productivity of employees through the use of improved methods and organizations, and the most effective power tools and machines.

Speaking before the recent annual meeting of the American Railway

Engineering Association, E. M. Hastings, chief engineer of the Richmond, Fredericksburg & Potomac, called for a more permanent track structure; F. R. Layng, consulting engineer, Bessemer & Lake Erie, expounded the economies available through the use of heavier rail; T. A. Blair, chief engineer of the Atchison, Topeka & Santa Fe, pointed to the opportunities for large savings in track maintenance by various methods of roadbed stabilization; and S. R. Hursh, assistant chief engineer—maintenance, Pennsylvania, said that there are no better ways to increase individual output than continued expenditures for labor-saving improvements, constant betterment of working methods, mechanization in ever-expanding application, and the constant application of technological developments.

Speaking of the need of the maintenance forces for more power tools and machines, one chief maintenance officer was heard to tell a group of equipment builders that there were unlimited opportunities for a tie-renewal machine, for devices for unloading and distributing ballast more uniformly, and for equipment with larger production capacity. In this latter regard, he said, "Can't you give us a machine that will tamp 8 or 10 ties at a time, instead of one?"

It's in the air. Over the last 30 years or more, in particular, maintenance men, stimulated by higher costs, have become increasingly conscious of the opportunities to offset rising costs through greater permanence in construction and further mechanization of work operation. The recent wage-and-hour settlement is certain to give still further stimulus to these efforts as the only practicable and effective means of pulling the railroads out of the dilemma confronting them.

PORTABLE TELEPHONES—

Safety Devices Par Excellence

Seldom has more enthusiastic praise been heaped on any device being used by maintenance forces than that accorded the portable telephone in letters received this month by our *What's the Answer* department. We were literally swamped by answers—many more than could be printed—extolling the advantages of equipping track gangs with such instruments. Letters were received from employees of several classes—from foremen to district engineers. All cited advantages in detail. *None* did more than mention disadvantages.

It is significant that nearly all the letters stressed the same thing—*Safety*. One foreman said, "If all gangs were equipped with portable phones—and in conjunction therewith made proper use of flagmen and a little common sense—accidents in which motor cars are struck by trains could be practically eliminated." "In my opinion," he continued, "this would be one of the greatest steps toward safety ever made." A roadmaster said, "I know of nothing that would contribute more to safety among maintenance-of-way employees than portable telephones —safety devices that have not as yet been put to full use."

A track supervisor wrote that almost every advantage imaginable can be claimed for the portable telephone, so long as wayside facilities are present for its use. At the present time, when aerial and buried cables are supplanting line wires, he wants jack boxes installed at frequent intervals to increase the effectiveness of his portable phones. Looking ahead, he says, "The expanding use of radio and radio telephones in railroad operations may find the track forces equipped with portable wireless units. Until that time, the use of portable telephones should be made more extensive."

These men, in "pulling" for the more general use of portable telephones have no "axes to grind" other than a sincere desire to get more work done at less cost to their employers, and to secure for themselves and their fellow workers longer lives, free of crippling injuries. They are merely saying to their own and other managements that have not yet seen fit to provide portable telephones for their track and other maintenance forces, "Give us good communication facilities and we will do an even better—safer—job for you."

SOIL MECHANICS—

A Necessary Aid in Stabilizing Track

Great progress has been made in recent years in the development and application of methods of stabilizing soft track. In fact, this progress has been so pronounced that it would be easy for many maintenance men to make the mistake of concluding they now have the final answer to the problem of unstable roadbed .

In recent years a large body of new knowledge has been built up around the science of soil mechanics. Railroads cannot be said to have achieved the ultimate in roadbed stabilization unless they have given proper weight and recognition to this new information. Yet, how many roads have done this? How many maintenance men responsible for determining track stabilization practices and programs have kept abreast of developments in soil mechanics? Is this knowledge being applied in making preliminary investigations and in determining what remedial measures are best suited to particular conditions? These questions will probably ellicit a number of negative answers.

There is no cure-all for unstable track. Because a method produces highly satisfactory results under one set of conditions does not mean that it will be equally effective under other conditions, even though they may appear by superficial examination to be comparable to those at the first location. For dealing with unstable conditions a number of different corrective measures have been developed, all of which have their particular field of effectiveness. To assure that the most effective method will be selected, there must be a practical application of the science of soil mechanics.

In an address before the American Railway Engineering Association meeting last month, Dr. R. B. Peck, research professor of soil mechanics at the University of Illinois, prophesied that eventually almost every road will possess the simple equipment needed to make subsurface explorations and will have on the payroll a man capable of using it. Further, he foresees that each road will have at least one small laboratory in which the routine tests for identifying and describing soils can be made. The fulfillment of these forecasts will be evidence of a completely enlightened attitude toward the entire problem of soil stabilization.

Track-stabilization procedures should be based on a thorough understanding of stresses and strains created in a roadbed by passage of high-speed trains

BY H. W. PROTZELLER
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Railway Ballast Engineers, Inc.
Milwaukee, Wisc.

Part 1

Track Stabilization—
A SCIENTIFIC APPROACH

• The word "stabilization" has recently come into prominence with reference to railroad roadbeds. To say that any structure is stable means that it is fixed firmly in place and has durability and permanence. In the track structure there are three parts that determine its stability as a whole. The first part is the combination of the rails, tie plates, fastenings and ties. The second part is the ballast. The third is the subgrade, or roadbed. To produce a completely stable track structure all three parts must possess the necessary stability within themselves.

To correct unstable track conditions it is necessary to understand thoroughly the stresses and strains that cause the unstable conditions. The dynamic forces created in a roadbed by the loads of locomotives and cars passing over the rails at high speeds are so complex that we can only arrive at their true nature by careful study of their components. It is impossible to produce a track structure that is 100 per cent stable under all conditions, because this would mean that there would be no movement whatsoever under any load. Furthermore, it has long been recognized that for best results there must be a certain degree of resiliency in track.

This is the first part of an intensely thought-provoking two-part article, in which the author, who has given much study to the subject, discusses the causes of unstable track and specific remedial measures. This installment deals essentially with track and roadbed loadings and stresses. Part II proposes the use of sand to increase the weight and frictional resistance of stone or other coarse ballast, and the injection of sand into the roadbed, by either of two methods, to overcome excessive moisture.

Elastic Constant

Unfortunately, there is no practical method in use today whereby the resiliency of track may be directly measured. If the track is soft, trains cannot be moved at high speeds and locomotives can only pull a portion of their rated load. If the track is too hard, the vehicles vibrate and shake, with many destructive actions. Theoretically there is such a definite measure, which, for the purpose of this article, we will term "E.C." (Elastic Constant). We all know that when a heavy load is applied to the rail head surface, a certain depression of the track structure as a whole takes place. Now, assume that along both rails of a piece of track we apply a weight, 100 ft. or more in length, sufficient in amount so that at the center of the weight a downward rail depression of one inch is obtained. The number of pounds, "W", per inch of rail length per rail to produce this one inch of rail depression is the elastic constant, "E.C.", of the track structure.

Under practical conditions, "E. C." will vary from 500 to 5,000. A track with an "E.C." of 5,000 can be obtained only by the use of the very heaviest type of rail, large ties, and extremely hard-tamped stone ballast on an unyielding roadbed. A track with an "E.C." of 500 is suitable only for the lightest kind of traffic. For the best all-around results a track should have an "E.C." of between 2,500 and 3,500.

Use Maximum Values

In all track calculations we must use the maximum values to which one rail will be subjected. Under practical conditions these maximum values may be assumed as under the forward truck of a Diesel-elec-

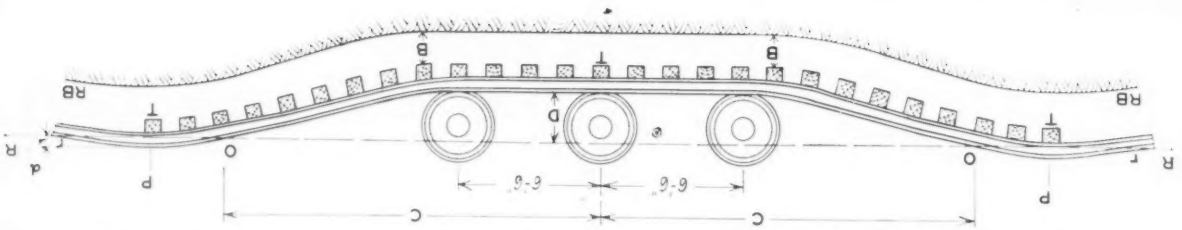


Figure 1—Showing, to an exaggerated scale, the depression of the track caused by a six-wheel truck with 50,000 lb. per wheel

tric locomotive with a six-wheel truck, loaded statically to approximately 30,000 lb. per wheel. When this locomotive moves at a speed of 100 m.p.h., the side sway and spring action cause an equivalent load of about 50,000 lb. per wheel, which is the figure to use.

Track Action Illustrated

In Figure 1 is illustrated, in exaggerated form, the depression of the entire track structure caused by a six-wheel truck with 50,000 lb. per wheel. In this figure the wheel spacing is 6 ft. 6 in. The original surface of the rail without any load is shown by line R-R. The surface of the rail under load is shown by line r-r. It will be noted that the depressions of the rail is zero at two points, one ahead of the truck and one behind the truck, designated as 0-0.

It will also be noted that at either side of these points 0-0, and even further away from the truck, the rail surface, r-r, rises above the original rail surface line, R-R. This maximum rise occurs at points P-P. The maximum depression, or distance between line R-R and line r-r, is directly under the center line of the truck and is represented by D. The upward rise of the rail surface at points P-P is represented by d. Under practically all conditions the value of d is 21 per cent of D. The distance from the center of the truck to the points 0-0 is represented by C-C.

All values are given in inches. The value C-C is a function of the weight of the rail and the "E.C." of the track, and is independent of the wheel load. The values of D and d are dependent on the amount of the wheel load, the weight of the rail, and the "E.C." of the track as a whole. The values of C, D and d are greatest for light rails and low values of "E.C."

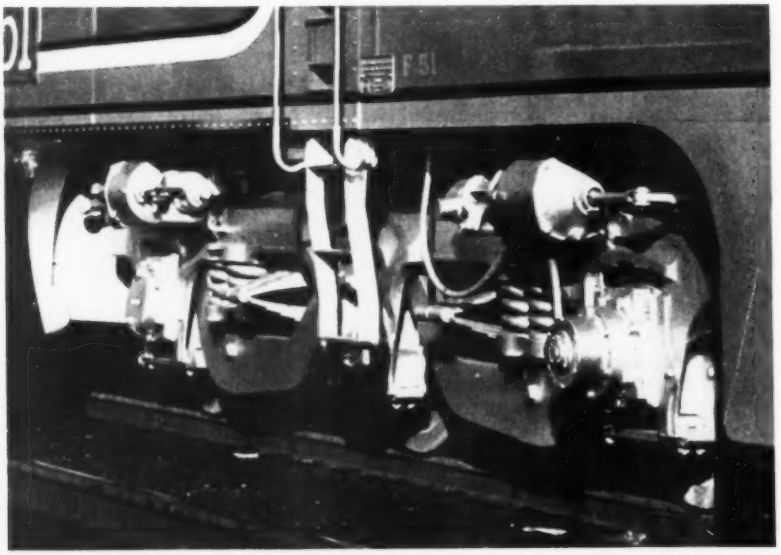
The accompanying table gives the values of various factors pertaining to Figures 1 to 4, inclusive, when a six-wheel truck, with the equivalent of 50,000 lb. per wheel, is stationary on a track with the elastic constant shown in Column 1.

The rails and ties of a track structure form an interesting combination of beam loadings, with rather peculiar support reactions or pressures on the supporting ballast and roadbed. With these forms of beam supports, the pressures created by the track load on the ballast underneath the ties is not uniformly distributed over the surface of the ballast base.

Track Reactions Due to Static Load

Values of various factors pertaining to Figures 1 to 4, inclusive, when a six-wheel truck of a Diesel-electric locomotive, with the equivalent of 50,000 lb. per wheel, is stationary on a track with the elastic constants shown in Column 1.

Col. 1 "E.C."	Col. 2 "C"	Col. 3 "D"	Col. 4 "d"	Col. 5 Sum of "D" and "d"	Col. 6 Lb. per Tie	Col. 7 Maximum Stress in Rails-P.S.I.	Col. 8 Ft.-Lb. of Wasted Energy Per Tie
1,000	210 in.	0.62 in.	0.136 in.	0.756 in.	29,000	27,000	550
2,000	189 in.	0.39 in.	0.082 in.	0.472 in.	32,500	22,500	420
3,000	179 in.	0.28 in.	0.059 in.	0.339 in.	34,000	19,200	380
4,000	174 in.	0.22 in.	0.046 in.	0.266 in.	35,500	17,500	320



The load used in the author's calculations is that caused by a 6-wheel Diesel truck

Pressures on Roadbed

Figure 2 represents the pressure distribution directly under the middle line of a standard tie, supported on approximately 12 in. of good ballast. Curve lines C-C represent the values of the pressures on the roadbed surface at various distances from the center line of the rail. The vertical lines p-p are the relative values of these pressures in pounds per square inch. The values of p are greatest directly under the center of the rail, diminishing in value on either side thereof.

Figure 3 represents the distribution of pressures under each tie longitudinally along the rail. Curve lines C-C again represent the distribution of pressures on the roadbed surface. The pressures are greatest directly under the center of the tie. Again, the vertical lines p-p are the relative values of the pressures on the roadbed surface. It will be noted that they are again greatest at the center of the tie.

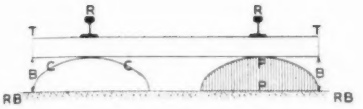
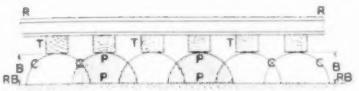


Figure 2 (above)—Pressure distribution directly under the center line of a standard tie supported on approximately 12 in. of good ballast. Figure 3 (below)—Distribution of pressures under each tie longitudinally along the rail



and that they diminish on either side thereof.

If vertical lines were projected upward from the center of each square inch of roadbed surface, representing in their respective lengths the actual pressure in pounds on each specific square inch, and the tops of these lines were covered with a flexible covering, this covering would have the appearance of half of a giant football approximately 42 in. in long diameter and 26 in. in short diameter. Now, if we imagine that this half football was molded into concrete and placed with the flat top surface against the bottom of the tie, we can form a clear idea of how these heavy pressures pound the surface of the roadbed, through the ballast as a transmitting medium, and tend to form a series of craters directly under the center of the rail.

With the truck as described in the foregoing on 131-lb. rail, the maximum pressures on the roadbed directly under the center of the rail at the center of the truck will vary from 82 p.s.i., where the "E.C." of the track is 1,000, to 102 p.s.i., where the "E.C." of the track is 4,000.

Conditions Under Moving Loads

Now, with a clear picture of what takes place when the locomotive is standing still, we will proceed to analyze the conditions existing when the locomotive moves along the track at a speed of 100 m.p.h., or 146 ft. per sec. The depression curve represented by Figure 1 will advance at the rate of 146 ft. per sec. At this speed, 89 ties of standard 19½-in. spacing are passed over every second. At points P-P, Figure 1, 89 ties per second are lifted off the ballast surface, and the same number of ties per second are depressed to their maximum, directly under the center of the truck.

Now, if we assume a soft track with an "E.C." of 1,000, we find by referring to the table that the total tie movement between points P and the center of the truck is 0.756 in. The bottom area of a tie is 918 sq. in. When the total tie movement is 0.756 in., the volume of tie displacement is 694 cu. in., or equal to approximately three gallons. If this movement of ties takes place at the rate of 89 per second, we have a tie pumping action, when the locomotive is traveling 100 m.p.h., of approximately 257 gal. per sec. It must be remembered that these figures apply to the forward truck only, and that the following trucks will multiply this by the number of trucks in the train, provided that the movement will be in proportion to the weight of the trucks.

Again, referring to the table, we see that if the "E.C." of the track is brought to 3,000 or more, this tie pumping action is reduced by approximately two-thirds. This pumping action is one of the most destructive to the track structure of any that will be encountered.

Referring again to the table, we see that if the "E.C." of the track is 1,000, the maximum stress in the rail is 27,000 p.s.i., but that if the "E.C." is brought up to between 3,000 and 4,000, this stress is reduced to approximately 18,000 p.s.i. This is extremely important when we realize that the elastic limit of steel rails is approximately 60,000 p.s.i. (The elastic limit of steel is the limit to which it may be stressed without a permanent set taking place.) Thus, the higher value of "E.C." provides a much greater factor of safety in the steel rails; also, a much longer life, and considerable less probability of breakage.

Wasted Energy

When the "E.C." is 1,000, the wasted energy per tie is 550 ft. lb. If the forward truck of the locomotive is moving at 100 m.p.h., or 89 ties per second, there will be 89 hp. of wasted locomotive energy for this truck alone. The number and weights of the following trucks will easily cause a wasted energy of several thousand horsepower. If the "E.C." of the track is raised to 3,000 or above, approximately 40 per cent of this wasted energy will be saved for pulling additional pay load. Over a period of one year under heavy-traffic conditions, this saving of locomotive horsepower represents a sum sufficiently large to pay for a considerable amount of track stabilization.

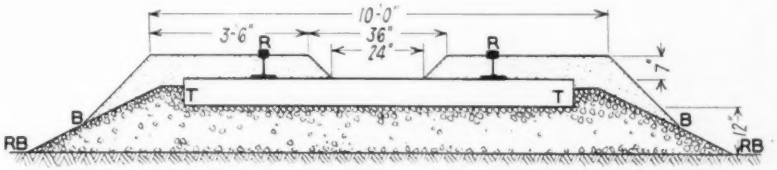


Figure 4—To minimize the movement the author proposes to increase friction within ballast by filling ballast voids with sand, as shown here. (See Part II next month.)

Ditching on the Illinois Central with a Thew TL-20 dragline

A.R.E.A. Holds Biggest Meeting

Record number of engineering and maintenance officers gather at Chicago to take part in celebration of association's Golden Anniversary. Attractions include many addresses, a banquet, and a large products exhibit.

• Drawn by a highly special program built around the association's fiftieth anniversary, a record number of railway engineering and maintenance officers attended the annual meeting of the American Railway Engineering Association at the Palmer House, Chicago, March 15-17. The total registration of members and guests for the three-day period during which the meeting was in progress came to 2,124, including 1,190 members and 934 guests.

The record attendance was only one of several outstanding features of this year's meeting. In fact, the general opinion among those present was that the meeting *as a whole* was one that could be described only in superlative terms. To make the most of the fact that the meeting was to be the culmination of 50 years of activity, a special program had been prepared under the direction of President C. H. Mottier (vice-president and chief engineer, Illinois Central). The principal objective of this program was to review the technological progress made in railway engineering since the association was organized, and to appraise the problems that remain to be solved. To this end, the program, in addition to the reports of 20 standing committees, included 23 addresses on a wide range of subjects. Other special features were an evening session and a banquet, each marked by a major address, and an attractive display of 600 photographs, depicting progress in railway engineering during the past 50 years.

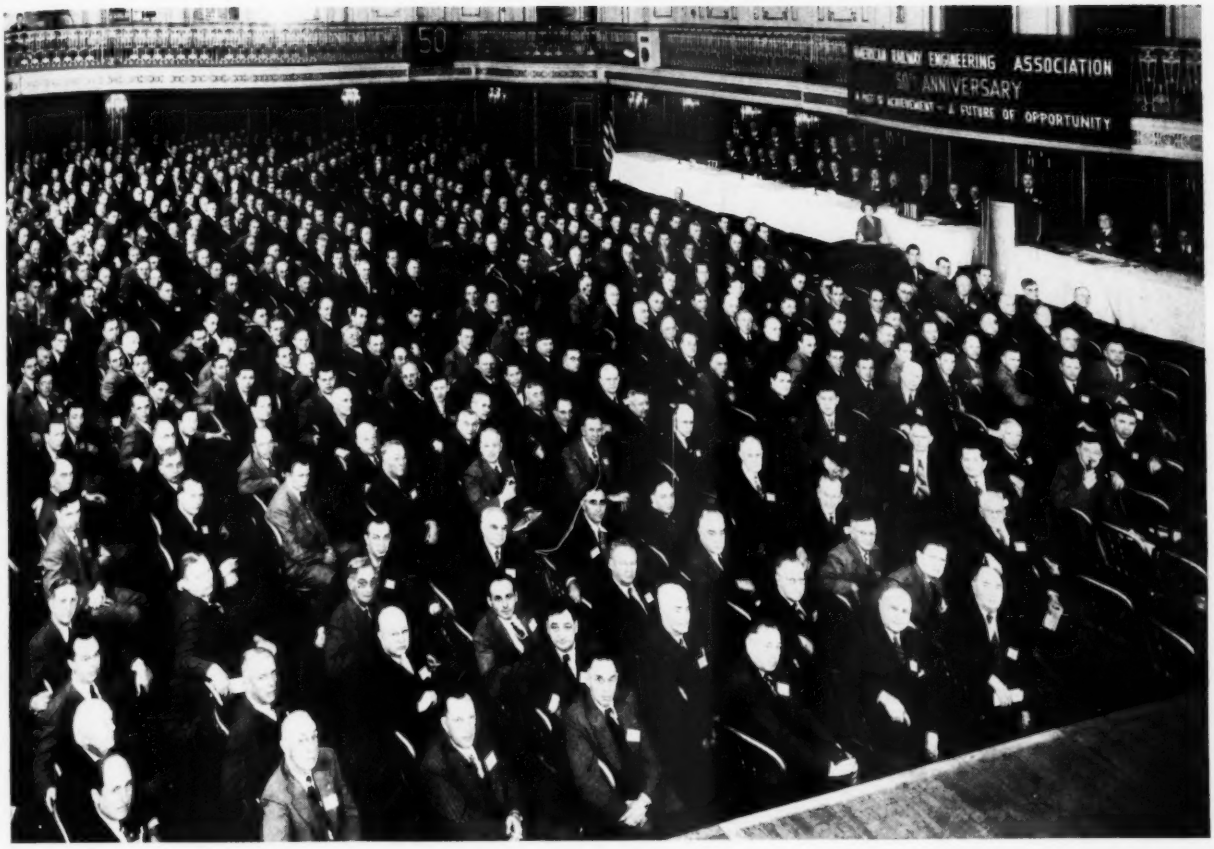
The opening session of the convention on Tuesday morning, March 15, was featured by five addresses, mostly of an inspirational nature. The first of these was by President Mottier. Then came Max K. Ruppert, president of the National Railway Appliances Association. This organization was the sponsor of a record exhibit at the Coliseum of equipment, materials and appliances used by the engineering and maintenance forces. Others on the program of the first session included J. H. Aydelott, vice-president, Operations and Maintenance department, Association of American Railroads; Ralph Budd, president of the Burlington Lines; and H. T. Heald, president, Ill. Inst. of Tech.

A bronze medallion, shown here slightly less than actual size, is being distributed to all members of the A.R.E.A.

Two of the addresses presented at later sessions of the meeting were designed to give members a general résumé of the achievements of the A.R.E.A. and an evaluation of its future opportunities. The one on achievements, given by H. R. Clarke, chief engineer, Burlington Lines, was read at an evening session held on Tuesday. This session, to which ladies were also invited, included entertainment and a showing of the motion picture "Wheels A'Rolling." The address of the future opportunities of the association was presented at the closing session by E. M. Hastings, chief engineer, Richmond, Fredericksburg & Potomac.

Reviving a former practice that was discontinued during the depression years, a banquet was held on Wednesday evening, at which the principal speaker was William T. Faricy, president of the Association of American Railroads.

A total of 15 addresses on technical subjects was read at the meeting, many of which were presented in connection with committee reports. The subjects of 12 of these papers, and the names of the speakers, were as follows: Roadbed Solidification, by Rockwell Smith, road-



In Grand Ballroom of the Palmer House during the opening session on March 15

way engineer, A.A.R.; The Future of Timber Supply, by C. D. Turley, engineer of ties and treatment, Illinois Central; The Future of Structural Engineering in Relation to Railroad Bridges, by Shortridge Hardesty, consulting engineer; What We Know About Impact, by A. B. Chapman, assistant chief engineer, Chicago, Milwaukee, St. Paul & Pacific; The Repair of Masonry Structures, by A. N. Laird, chief engineer, Grand Truck Western; The Effect of Diesel Operation on Fixed Properties of American Railroads, by J. B. Akers, chief engineer, Southern System; Investigation of the Relation Between Track and Equipment, by J. R. Jackson, mechanical engineer, Mechanical division, A.A.R.; Future of Soil Mechanics in Railroading, by Dr. R. B. Peck, research professor of soil mechanics, University of Illinois; Recent Developments in Preservation Treatment, by Dr. Hermann von Schrenk, consulting timber engineer; Recent Developments in Water Treatment, by R. C. Bardwell, superintendent of water supply, Chesapeake & Ohio; Achievements of Grade Crossing Protection, by W. J. Hedley, assistant chief engineer, Wabash; The Future of Research on American Railroads, by G. M. Magee, research engineer, A.A.R.

The technical addresses included three papers that were read as part of a symposium on the question: How can the railroad construction and maintenance engineer best meet increasing cost of labor and material? Answering this question, F. R. Layng, consulting engineer, Bessemer & Lake Erie, spoke on Heavier Rail; S. R. Hursh, assistant chief engineer — maintenance, Pennsylvania, discussed Increased Mechanization; and T. A. Blair, chief engineer system, Atchison, Topeka & Santa Fe, spoke on Roadbed Stabilization.

The following officers were elected to direct the affairs of the association during the ensuing year: President, Fred S. Schwinn, assistant chief engineer, Missouri Pacific Lines, Houston, Tex.; vice-president to serve for two years, H. S. Loeffler, assistant chief engineer, Great Northern, St. Paul, Minn.

The directors named were I. H. Schram, chief engineer, Erie, Cleveland, Ohio; A. B. Chapman, assistant chief engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago; Neal D. Howard, editor, *Railway Engineering and Maintenance*, Chicago; and C. B. Bronson, maintenance of way assistant to vice-president, New York Central, New York. Members of the nominating committee are: R. P. Hart, chief engineer, Missouri Pacific, St. Louis, Mo.; J. C. Aker, chief engineer, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; F. H. Simpson, engineer maintenance of way, Lines West, New York Central System, Chicago; G. M. O'Rourke, assistant engineer maintenance of way, Illinois Central, Chicago; and A. N. Laird, chief engineer, Grand Trunk Western, Detroit. In addition, G. L. Sitton, assistant chief engineer, Southern, Washington, D. C., and vice-president of the association, was advanced automatically to senior vice-president, succeeding Mr. Schwinn. Meeting after the close of the convention the Board of Direction elected as a director G. W. Miller, assistant engineer maintenance of way, Eastern region, Canadian Pacific, Toronto, Ont., to fill the vacancy created by the advancement of Mr. Loeffler to vice-president.

Mechanization the Answer

BY S. R. HURSH
Asst. Chief Engineer-Maintenance, Pennsylvania
Philadelphia, Pa.

• The railway maintenance engineer is facing a great challenge. Trends in labor rates, material prices and traffic revenues are seriously threatening the future of the railroads. The Interstate Commerce Commission, aware that there is a large amount of deferred maintenance in the railway properties, has called on the railroads to reduce operating costs. At the same time other governmental agencies are increasing taxes, recommending increases in wages, and openly subsidizing competing forms of transportation. Labor regulations are becoming more costly, material prices are at high levels, material shortages continue in some commodities, and the requirements of regulatory bodies continue to increase. The challenge to the maintenance engineer—as costs go up—is to offset them just as quickly as possible by increasing efficiency of man-hour output.

Can't Lower Standards

There are many methods to reduce maintenance expenditures. Among them are to reduce forces, lower maintenance standards, increase labor output per man, improve the design of the track structure, and mechanize hand operations. However, to meet competition, we must continue to provide a high-speed, heavy-duty track structure on our main lines; trackage reduction is possible only on a few branch lines. Lowered maintenance standards or an arbitrary force reduction is not a feasible or practical approach. Increased labor efficiency from the standpoint of individual output is doubtful as present social tendencies and working regulations continue to contribute to diminish personal output, and any expectation of improvement is contrary to foreseeable trends.

In view of the large amount of deferred maintenance now existing on Class I roads, any appreciable decrease in work units expended on the properties will be highly injurious. Thus, only by improving working methods, abolishing unnecessary work, and mechanizing hand operations can we have a reduction in man-hours. This reduction will not be in work units, but will be brought about through increased efficiency.

Must Continue Mechanization

Examining the past record of Class I roads we find that in 1937 it was necessary to expend 376 man-hours of m.w.& s. labor per million gross ton-miles, while in 1946 only 307 man-hours were expended—an 18 per cent reduction. While it is admitted that due to labor and material shortages and other causes deferred maintenance was present in both 1937 and 1946, and in even greater proportions during the war years, we believe that most of this reduction in man-hours was due to improved working conditions, mechanization of hand operations, and improvements in road and equipment.

Wages and Investment Compared

Comparing average hourly Group III straight-time compensation with investment in roadway machines per mile of main track, we find a close relationship. In the years from 1936 to 1946, inclusive, compensation increased 96 per cent, while investment in roadway machines increased 111 per cent. Only by continuing these trends in future years can we hope to maintain the railroads economically and increase output per man hour. There is no better way to increase individual output commensurate with increased compensation than continued expenditures for labor-saving improvements, constant betterment of working methods, mechanization in ever-expanding application, and the constant application of technological developments.

In the face of recent wage increases and the forty-hour week, railway maintenance engineers must stop and analyze their present position in regard to mechanization, and

SEEN AT A.R.E.A. MEETING

C. H. Mottier, president of the A. R. E. A., at the speaker's rostrum

Facing camera: B. Blowers (Erie), E. C. Vandenburgh (C. & N. W.), E. E. Mayo (S. P.), T. A. Blair (A. T. & S. F.), J. L. Gressitt (P. R. R.), H. R. Clarke (C. B. & Q.)

To High Costs

This article is one of three addresses presented before the annual meeting of the American Railway Engineering Association in Chicago, March 15-17, in a symposium on how the railroad construction and maintenance engineer can best meet increasing cost of labor and material. In it the author sees further mechanization as one of the most potent means available; cites numerous unsolved problems; and calls for the further adaptation of power tools and machines to cut costs of maintenance work.

Economical maintenance in the future will demand ever-expanding mechanization

evaluate approaches to increased mechanization in the future.

At the end of 1948 the investment of Class I roads in maintenance-of-way equipment of all types was approximately $200 million, as represented by Road Machinery and portions of Work and Miscellaneous Equipment accounts. This investment represents many types of machinery in all degrees of condition. Undoubtedly a considerable portion of this investment is in obsolete types, or in worn-out units.

Check Equipment Inventory

Each railroad should analyse its present investment in maintenance machinery. All machinery should be checked for condition and obsolescence. Total investment in each type of machine should be compared with work needs for that type, to determine if a proper ratio is being maintained. Also, age groups should be worked out for each type of machine to avoid getting into the position of trying to perform a certain operation with a group of obsolete machines, and then wondering why costs increase and the work is not being done.

Generally speaking, the usefulness of a machine decreases with age. We must recognize this fact. Immediate purchases should be made of types of equipment in which we have an under investment as regards quantity of work to be done, machinery age and potential savings. Antiquated machinery should be retired or, possibly, converted to some other use. Many machinery purchases in the past have been made on a hit-or-miss basis. I urge that future machinery applications be made on a carefully systemized basis with regard to investment, design trend and maximum utility. Purchasing departments must be brought in line with this policy and consider the overall picture, rather than the initial dollar cost of a machine.

Multiple Uses of Machines

Many machines now on hand are capable of multiple uses, but are not being so utilized. Others, by slight conversion, could be adapted to other uses. Crawler compressors, for example, may be profitably employed

(All names read left to right)

D. C. Hastings, J. A. Blalock, S. Shumate (all R. F. & P.), V. F. Grubaugh (P. R. R.)

L. R. Lamport (C. & N. W.), R. L. Groover (A. C. L.), C. B. Bronson (N. Y. C.), A. N. Laird (G. T. W.)

during the winter months for gaging and anchor spiking, and certain types of mowers can be converted to snow plows or brooms for winter use. Undoubtedly, thorough investigation would disclose multiple uses for many other machines which are normally worked only in certain seasons of the year.

Equipment repair programs should be accelerated so that machinery is not allowed to stand idle while awating shop space. Mobile repair units should be provided so that working-season breakdowns are quickly corrected in the field. Railroads operating in regions of widely varying climatic conditions could well transfer machinery between regions for all-year utilization.

Keep Adequate Records

Although generally neglected, it is important that full records be kept for each machine, showing date of purchase, cost, repair dates and, possibly, multiple uses. Working locations should be carefully logged for each machine to insure the proper placement of all machinery to meet work needs. Occasional field checks are of value to determine if machinery is being properly and efficiently employed. Perhaps some supervision tends to discount the use of machinery. This type of thinking must be overcome if the greatest possible savings from equipment are to be obtained.

Another important field in efficient equipment utilization that is virgin territory to most railroads is that of maintaining adequate cost and performance records of comparative hand and machine methods, and of various types of machinery on various jobs. This type of study, when made by trained men, is most useful in determining future machinery assignments for maximum economy, in revising inefficient working methods, in devising improved machinery, in preparing budgets, and in drawing up requests for machinery expenditures, and offers, in return, rewards of substantial savings.

Machinery officers and supervision must be chosen for alertness, ingenuity and ability, and incentives must be provided in the way of advancement and salary to insure their continued interest. The machinery officer is a valuable trained specialist and his important work must not be delegated to untrained and disinterested personnel.

The foregoing varied considerations all have an important bearing on obtaining maximum efficiency from our present investment in m.w. machinery, and only until our position in all of theim is consolidated do I suggest the next approach to the problem, which might be entitled Future Requirements and Designs.

Must Exercise Ingenuity

To keep abreast of technological advances and fully develop maximum efficiency from mechanization, the railroads must exercise constant ingenuity. From cost studies and field observation we should know where we are failing to eliminate costly hand operations. Even casual thought brings many operations to mind that offer opportunity for improvement.

Generally speaking, section gangs are under-mechanized. There has not been sufficient adoption of spot-surfacing machinery, possibly because some developments in this line were poorly suited to the needs. Mowing and brush cutting still involve too much hand labor, due to insufficient investment and a high rate of mechanical failure in present machinery. Spot tie renewals are costly and involve considerable digging and handling. Splice, spike and bolt renewals by local gangs offer room for improvement. Local rail-changing operations are uneconomical; perhaps something could be worked up in the way of a specially equipped truck to move rail from mileposts—fitted with compressor to pull and drive spikes and take care of bolt changing. Such a unit would be most useful in handling broken rails at night.

Crib Cleaning

Although we have made good progress, we still do not have the final answer to crib cleaning. On some railroads this is probably the most important track operation needing improvement. You cannot maintain satisfactory track conditions with foul cribs, and much of the present intertrack and border cleaning is failing due to foul cribs. Crib cleaning demands concentrated study and research to achieve satisfactory results, both from quality and cost standpoints. Hand cleaning has been priced entirely out of the picture.

Considerable hand labor is wasted leveling ballast, dressing shoulders, moving cinders and sloping banks. Further progress is essential in equipment to deliver ballast in proper quantities to the proper place, and to level and dress it. This is a fertile field for investigation.

Although rail operations are fairly

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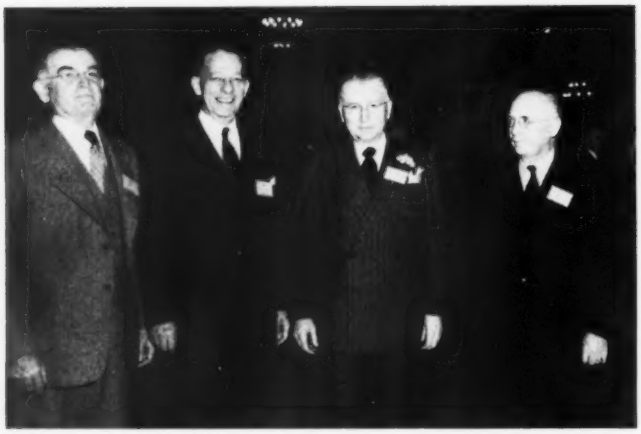

G. J. Ray (D. L. & W., retired), F. S. Schwinn (M. P.), G. M. O'Rourke (I.C.), C. R. Wright (N. Y. C. & St. L.)

A. H. Whisler (P. R. R.), W. L. Turner, Jr. (R. E. & M.), J. P. Newell (P. R. R.), H. E. Michael (R. E. & M.)

well mechanized, there is still room for improvement, especially in the matter of distributing material and picking up scrap—both wasteful hand operations. The parceling of material in bundles for each rail and delivery by magnet is a possibility. Modern ingenuity certainly can provide an answer to the matter of picking up scrap after the rail is laid and sorting it properly for disposition.

Field for Trucks

The use of off-track machinery and operations by the aid of trucks, using widened berms, are also of major importance. Many work-trains could be eliminated by using trucks for the delivery of material—with considerable saving. Thousands of man-hours are lost each year by gangs having to walk to point of work from nearest road crossing or set-off. Your improvement program should certainly include a schedule of berm widening to permit the use of trucks and free the tracks for revenue traffic. Specialized truck designs would lower the cost of transporting machinery, and many of our present machines could be truck mounted. Properly equipped trucks for welders, grinders, painters, bolt-tightening gangs, and many other appropriate outfits would result in great savings in man-hours and increase in efficiency.

Delivery of Ties

The delivery of ties involves a large amount of hand labor and is a source of many accidents. Perhaps it is possible to palletize tie shipments, transferring the units by crane to a properly designed truck for delivery along the track, where they could be unloaded by some contrivance. There is no reason for present wasted labor in tie handling. Similarly, the disposal of ties released from track is usually a wasteful hand operation, as well as a source of annoyance to everyone concerned. This operation should also be mechanized.

Be Open to Suggestions

These are only a few examples of unsolved problems and of possible cures. There are literally hundreds of such operations needing correction. Many of them can be corrected by existing machinery properly applied, but many others must be carefully studied and corrected by some new mechanical approach. Suggestions from field supervision should be encouraged, and be freed from red tape. Many of us lose touch with field problems and become engrossed with our own daily problems. We cannot afford to view lightly the suggestions of our men in the field. Furthermore, we must avoid mental lethargy and be ever alert for improvements. This is our job as maintenance engineers and the results we obtain will depend on our resourcefulness.

The equipment manufacturers deserve high praise for their research and products, but they cannot do all the creative work. Much closer to our problems, we must find the operations to be improved and line up possible solutions. Having done this, I am sure that the manufacturers will cooperate in the development and manufacture of the necessary equipment and materials. They always have and I am sure they always will.

Watch Other Industries

Developments in other industries should be closely followed by the maintenance engineer. Many improvements in other fields can be adapted to railroad use with a little ingenuity, and a considerable amount of research can be saved by watching the man who "builds the better mousetrap."

For example, we can learn much about low-cost earth moving and grading from the contractor and mining engineer, who specialize in these classes of work and who have devised many cost-saving methods. Similar parallels are to be found in many fields, and we must be alert to follow them and to use our imagination in adapting them to the needs in our field.

I can hear the representatives of smaller railroads saying, "All that is fine, but where can we get the money to buy these machines or find the time to investigate and develop them."

Naturally, conditions vary greatly among railroads, but it is certain that ingenuity is not confined to any one group. Along this line, perhaps joint ownership of machinery can be worked out by two or three roads, or perhaps railway contractors can be interested in purchasing these machines for rental purposes. There are many possible approaches to the problem, and I am certain that it can be solved.

Above all, this is no time for complacency or resting on our past record. The difficulties ahead of us are grave but certainly not insurmountable. We must approach them with open mind, confidence, ingenuity and resolution if we are to achieve our goal.

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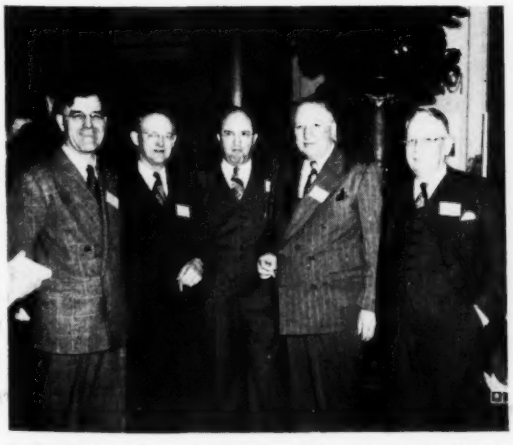

P. F. Nichols, R. L. Dykes, R. J. Pierce, C. K. Scott (all Erie), C. A. Daley (Air Reduction Sales Co.)

L. E. Gingerich, C. J. Code, W. C. Gretzinger, Spencer Danby, M. C. Bitner, J. W. Buford (all P. R. R.)

Overcoming Failures i

By A. N. LAIRD

Chief Engineer, Grand Trunk Western
Detroit, Mich.

Recognizing that eventually all exposed masonry structures may require repairs and possibly restoration, the author of this article, which was presented originally as a paper before the annual meeting of the American Railway Engineering Association in Chicago, March 15-17, describes the causes of most masonry failures and the currently accepted methods of repair and restoration. Prominent among the methods described are patching, application of shotcrete, grouting of concrete aggregates, and internal grouting.

• We should frankly recognize that all structural materials are subject to deterioration when exposed to the elements of nature. Eventually, after years of service and exposure, any masonry structure may require repairs and possibly restoration. At such times it is important that each case be analyzed individually and methods adopted which will prove most effective and economical.

In some of the old stone masonry structures, soft stone and lime mortar were susceptible to the action of water and alternate freezing and thawing, resulting in erosion and cracking. Frequently a lowering of the general ground water level, or seasonal fluctuations in stream flow, exposed the originally submerged timber foundation mats and piling, which caused rotting of the timber and settlement, resulting in structural cracks. Also, in many of the large early structures the cut stone blocks were used only on the exterior faces of piers, abutments and arches, and the backing and interior material consisted of man-size irregular stones or spalls laid in random fashion, with little or no attempt to fill the voids with mortar. Large cracks frequently developed in such structures, which were of such concern to the engineers as to require effective repair or replacement of the structures, whole or in part.

Concrete Structures

In the case of concrete structures, the problem is more complex. The cause may have been the use of unsound coarse stone or gravel aggregates, or the presence of soft, porous sandstone, shale, chert or organic matter, which disintegrates, spalls, cracks, and is subject to other serious defects when subjected to water and cycles of freezing and thawing or alkaline action. Too, in the early days little attention was paid to the fineness and proper proportioning of the fine aggregates which were combined with the cement paste to form the mortar that would fill the voids in the coarse aggregates and cement the entire mass together. This resulted in a porous or oversanded concrete which lacked durable qualities.

Varying views and construction practices were likewise prevalent, depending on the period. At one period the inner faces of the forms were plastered with mortar to give a smooth surface finish, and a dry rammed backing of concrete was placed in layers with little regard for the location of construction joints. At another period it was thought that an excess of water was necessary to hydrate the cement, but this practice proved very detrimental to quality and caused excessive laitance, segregation of aggregates, voids, and porous concrete, susceptible to the destructive action of water and of freezing and thawing.

Faulty provision for structure drainage and lack of care in the selection of porous backfill over arches and behind walls and abutments also contribute to progressive disintegration.

Plans Should Be Prepared

Before undertaking repairs to a masonry structure, a thorough inspection should be made to determine the nature and extent of the deterioration and defects. In cases where strengthening of the structure is necessary, engineering plans should be

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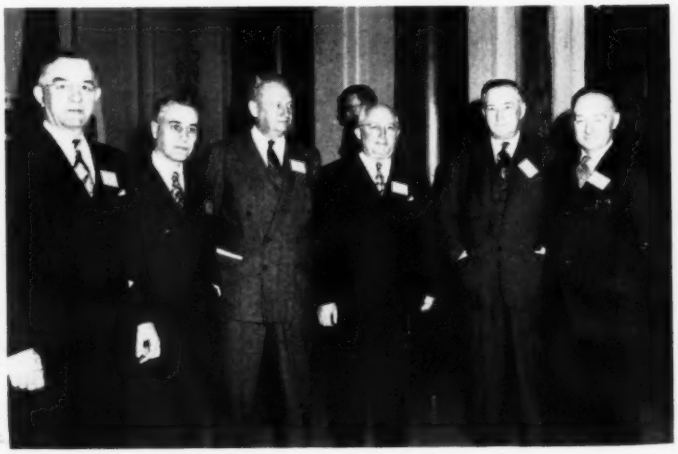
L. H. Laffoley, G. A. Morrison, J. R. Nutter, R. F. M. Marshall (all C.P.R.)



W. G. Cowie, C. C. Lathey, F. H. Simpson, W. H. Miesse, J. C. Ryan (all N.Y.C.), C. T. Gunsallus (B.&A.)

in Masonry Structures

carefully prepared. Correction of faulty drainage facilities should be made prior to general repair work to prevent the impounding of water at points where it would damage the masonry.

Methods of repairing and restoring deteriorated stone and concrete masonry structures may be broadly classified as patching, restoration, encasement and internal grouting.

Patching

Patching is generally applicable where there is local disintegration of the surface, spalling, surface checking or crazing, or where sections of the surface material have separated from the main mass, or where there is loose, honeycombed or disintegrated concrete or stone on the surface over small areas. Such surface material should be removed to a depth which will expose sound, hard materials. Where the purpose of the work is mainly to stop progressive surface disintegration, which in time would impair the strength or serviceability of the structure, the depth of the area to be patched may be as little as two inches or it may exceed this by a considerable amount. The edges should be cut approximately square with the surface or slightly undercut to avoid thin or feathered edges. Abrupt changes in the depth of such cuts should also be avoided. Where the areas to be patched are small, the work may be accomplished by hand methods if desired, but where the area is more extended, other methods, which will be described, are preferable and produce more dependable and uniform results.

In all such surface repair work it is of the utmost importance that the bonding surface of the old structure be thoroughly cleaned and be free from oil or coating of any material which would reduce the bond strength. Loose particles of dust and dirt should be removed and the surface left rough and clean. The surface should be thoroughly wetted immediately prior to the placing of the new material, preferably for an hour, except in freezing temperatures. Suitable metal anchors should be provided of such size, spacing and depth of anchorage as may be determined by the character and condition of the old material and the amount of new material to be applied. Such anchorage should be capable of developing the tensile strength of the anchor rod.

The new concrete material should be reinforced with steel bars or mesh of cold-drawn steel wire, or a combination of the two, depending on the thickness and type of the surface application. The reinforcement should be rigidly attached to the metal anchorage system, and wherever possible the mesh should be stretched tight and lapped for suitable bond.

In each of the repair methods the importance of the quality of portland cement, and of the aggregates, and their grading, storage, handling, proportioning, mixing, placing, compaction and curing, must receive the careful attention of the engineer, much the same as for new concrete construction. These matters are fully covered in the current Manual of the American Railway Engineering Association.

The placing of ordinary concrete for this purpose may be difficult in

Disintegrating concrete wing wall

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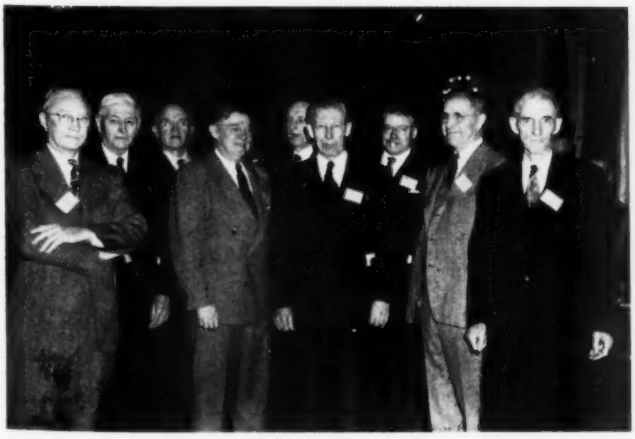

F. E. Bates, G. B. Campbell, W. H. Vance (ret.), J. R. Showalter, A. A. Miller, P. P. Wagner, W. J. Burton, R. P. Hart, G. W. Payne (all M.P.)

W. J. Hedley (Wab.), G. M. O'Rourke (I. C.), G. E. Martin (I. C.)

many cases, particularly on the underside of a member, or at points which are inaccessible for ordinary concreting operations. There are also problems involving bonding to the old surface of the structure, and shrinkage when the concrete hardens. However, this procedure has been widely used for heavy encasements and for heavy buttresses and facing, and under favorable conditions may be the most economical method.

Shotcrete Explained

Shotcrete may be defined as a material consisting of portland cement, sand and water, placed pneumatically by means of equipment which discharges water and pre-mixed cement and sand, under regulated pressure, through pipes or hose and a discharge nozzle—the water being combined with the sand-cement mixture at the nozzle. It has been widely used for many years as a method for restoration and encasement. It is quite fully described in the specifications appearing in the Manual of the Association under the recommendations of the Committee on Masonry. These specifications, however, are now being revised by the committee and when the new recommendations are adopted it is believed they will outline the best practice for such material and its application.

It is very important that shotcrete be placed by an experienced operator. Poor work will result if the material is permitted to build up too fast or too thick in local areas. The material must be shot approximately perpendicular to the surface to avoid loss of cement due to rebound. Care must also be taken to get through embedment and bond of all reinforcement. The application for thick sections should be made in progressive stages, preferably about one inch in thickness, so that no surface will set more than two hours before the next application. By this method a homogeneous mass is built up. Shooting strips should be used to insure true surfaces and edges. When it is necessary to stop the application before reaching the final contour, such as at the end of the day's work, the surface should be thoroughly wetted and all loose or uncemented particles removed before applying new shotcrete. When shotcrete is used to build up thick sections, multiple layers of steel mesh, combined with bars, should be used and these should be thoroughly anchored to the old masonry. Shotcrete surfaces require care in curing and should be kept damp for at least four days after placing.

If a special surface finish is desired over the shotcrete, this may be obtained by applying a flash coat of shotcrete over the entire structure to give it a uniform texture, or the base shotcrete may be rubbed or lightly trowelled if a smoother texture is desired. It is generally considered better practice not to disturb the final surface of the shotcrete any more than is necessary. However, there is some difference of opinion among engineers on this point.

Grouted Concrete Aggregates

The third method applicable to restoration work or encasement may be referred to as grouted concrete aggregates. The initial preparation up to and including the erection of the concrete forms is little different for this method than for ordinary concrete, except that grouting pipes are installed at intervals of 3 to 8 feet, or more, depending on the form of construction, extending through the face of the forms and into the area to be restored. Such grouting pipes should be prepared at the outer exposed end for convenient and rapid attachment and removal of the grouting lines, and in such manner as to avoid leakage or loss of pressure as the grouting progresses.

At this stage, however, the methods differ. After thoroughly flushing out the forms and wetting down the old surface, the space between the concrete forms and the surface of the old structure should be filled with well graded coarse concrete aggregates of accepted standard. Such material should be vibrated in the forms to create as compact a mass as possible. The objective is to fill completely all voids of the coarse aggregate with cement grout, applied so as to expell all air or water and form a strong, dense concrete that is securely bonded to the old surface and subject to a minimum of shrinkage.

Grouting Mixture

The entire section to be grouted should be thoroughly wetted, including the aggregates in the forms and the surface of the old structure where bonding is desired, and the water should be permitted to drain off if practicable. Immediately following this the grouting operation should be started by pumping the grout into the forms under controlled pressure at the bottom grouting holes. Experience has indicated that a grouting mixture composed of one part of portland cement, three parts of fine graded sand, and a suitable admixture of a

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Two members of arrangements committee, G. R. Wescott (M. P., retired), and A. B. Pierce (Sou.)

W. A. Spell, L. E. Bates, J. L. Wilcox, F. L. Etchison, A. V. Hooks, D. P. Packard, Jr. (all A. C. L.)

type which will hold the sand in suspension and prevent separation, and at the same time increase the fluidity of the mixture and counteract mortar shrinkage, is required for best results.

Grout may be applied by various means, but usually it is pumped, continuing the operation at each hole from the bottom toward the top until grout appears at adjacent holes in the row next above that at which the pumping is taking place. The grouting line would then be moved to the next hole on the same elevation, and the procedure repeated, plugging each grout hole as the grouting at that point is finished and continuing until the entire section scheduled for grouting has been completed.

Finishing the Surface

When the grout reaches top surface, a finish may be obtained by placing a layer of ordinary concrete integrally with the grouted material before it has taken an initial set. A finish may also be obtained by placing a quantity of finer graded aggregates in the upper portion of the form to a depth of four to six inches, and continuing the grouting to the surface, which may then be trowelled when it reaches the proper degree of setting. Where the top surface of the grouted material is to become a bearing area for the support of heavy loads, special treatment is sometimes required. Sometimes the grouting is carried slightly above the finished surface elevation and is ground or dressed down on top to provide the bearing surface desired. After stripping the forms the desired surface finish is obtained by following the same methods as would be applicable to ordinary concrete. For heavy construction it is preferable to leave the surface without rubbing or grinding, except at form joints and form tee bars, where any cement fins should be removed.

Internal Grouting

As mentioned previously, many early stone masonry structures were built without much attention to the necessity of filling large internal voids and cementing areas between internal stones, which were placed at random. Cracks and voids in concrete structures introduce much the same problem. Through the years, the action of the elements and the pressures resulting from the passage of thousands of heavy trains have frequently resulted in cracks in such masonry and local deterioration, which have been a source of great concern to engineering officers. In a number of cases, structures, which in the aggregate would have cost millions of dollars for reconstruction, have been restored to sound condition at only a small fraction of the cost of replacement.

The method of repairs which has proven effective in many such cases may be referred to as internal grouting—employed as a means of consolidation. Essentially, this consists of drilling holes at intervals in carefully selected locations from the exterior of the structure, and, after suitable preparatory and exploratory work, grouting such holes full of a mixture composed of portland cement, fine sand and an admixture. The admixture should be of a type which will improve the fluidity of the grout and prevent separation of the sand, and at the same time counteract shrinkage, so that the grout will pass through even small cracks to fill internal voids and thoroughly consolidate the entire structure into a single cemented mass. The relative proportions of cement and sand will be determined by the individual job requirements.

Initially, holes should be drilled at critical points to investigate the internal structure. The action of the drilling bit will tell an experienced operator the hardness of the stone or concrete through which the drilling is progressing and whether shattered rock or concrete materials or internal voids have been encountered. This preliminary information is of great value in planning the ultimate treatment. Even inaccessible areas of piers under water and in the footings may be reached by such drilling, and, under favorable conditions, the grouting methods may be extended to consolidate the foundation material under the structure. Holes for grouting should then be drilled, of ample size to prevent clogging, and should be of such depth and location that grouting will proceed from the bottom and center toward the outside and top of the member. Before pumping grout into these holes, the holes should be flushed out with water under pressure. This operation will not only clean out all dirt and drilling dust but will show what effective area each grouting hole will serve by noting the points where the water escapes. The effectiveness of such internal consolidation may be checked by core drilling in critical sections.

(All names read left to right)

A. Gaile (Bellfield Welding Co.), J. E. Good, E. L. Gosnell, C. L. Wenkenbach (all Reading)

R. G. Brichler, W. J. Neubling (both A. & S.), W. G. Powrie (C. M. St. P. & P.), R. E. Patterson (L. V.)

Water Treatment Makes Further Developments

Railway water service has seen many developments and improvements over the years, spearheaded largely by the efforts of the Committee on Water Service of the American Railway Engineering Association. What these developments and improvements have been, especially as affecting the treatment of water for both steam and Diesel locomotives, are highlighted in this article, which is an abstract of an address presented by the author before the Golden Anniversary Convention of the American Railway Engineering Association in Chicago on March 16.

• An adequate supply of quality water is an operating essential of all railroads using steam locomotives. Water is also necessary in less volume, but more refined quality, for roads using Diesel power. The total amount of water used exceeds, in both volume and weight, all other material used by the railroads. Under such conditions it can be readily understood that any deficiency in quality can have a direct effect on operating economy and efficiency.

That the importance of good locomotive boiler water was appreciated by the founders of the American Railway Engineering Association is seen in the fact that such was made the subject of one of the first standing committees of the association. This committee has reported the results of its investigations and research, together with its recommendations, in the annual Proceedings of the association, beginning with the first volume published in March, 1900. The reports of this committee include descriptions and recommendations for best practice in the design, equipment, installation and operation of railway water stations. Probably the most important problem considered by the committee, and the one which has yielded to the greatest improvement in overall results, is the treatment and proper conditioning of boiler feed-water and, more recently, the conditioning of water used on Diesel power.

Although the softening of water was first developed in Scotland and England about 1840, the greatest improvements in practice and efficiency have taken place since 1900 on the railroads in the United States which, unquestionably, now lead the world in the application of this branch of technical science. This leadership has been brought about largely through the efforts of members of the A.R.E.A. Committee on Water Service, working together, and in some cases with the cooperation of reputable water treatment concerns which have highly developed research laboratories studying many of the intricate details. The accomplishments in this direction, as listed in the 1946 Proceedings of the Master Boiler Makers' Association are as follows:

(1) Made possible long runs of steam locomotives.

(2) Permitted use of high-power locomotives.

(3) Reduced fuel consumption.

(4) Saved the railroads not less than $30,000,000 annually.

(5) During each war year, saved a substantial tonnage of steel.

(6) Contributed very largely to the high availability of steam locomotives, which made it possible for about 42,000 locomotives to deliver nearly twice the work done by 64,000 locomotives in World War I.

(7) Reduced shopping time of locomotives to the minimum required by machinery repairs.

(8) Contributed to a performance record wherein boiler failures are virtually eliminated.

A brief summary of the more recent developments in water treatment on the railroads might be listed as follows:

(1) The practical elimination of

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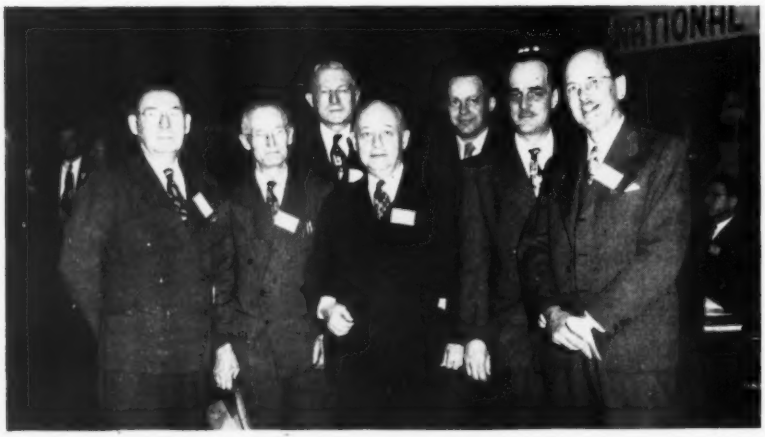
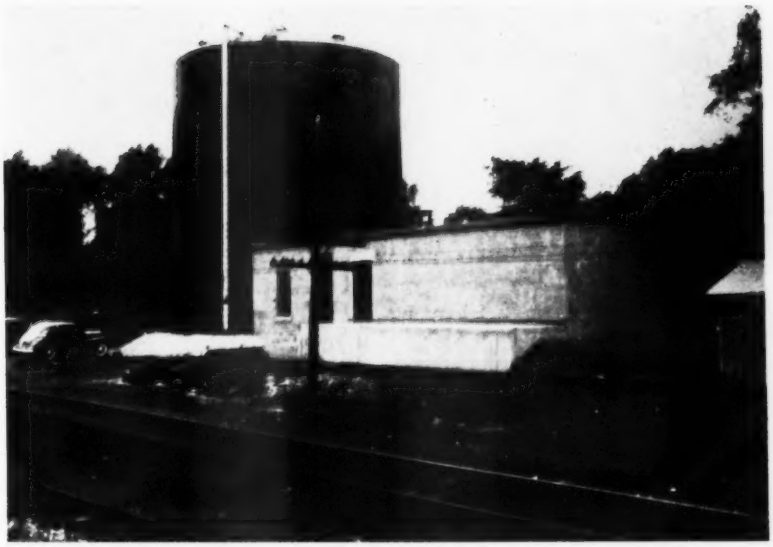


G. M. Strachan, J. R. Rushmer (both A. T. & S. F.), Lem Adams (Ox. R. R. Ser.), W. W. Kelley, G. Rugge, W. R. Wilson, C. H. Sandberg (all A. T. & S. F.)

Danny Heiman (Palmer House), official A. R. E. A. page boy since 1926

Big Strides—Promised

By R. C. BARDWELL
Superintendent Water Supply
Chesapeake and Ohio, Richmond, Va.



Modern lime-soda ash water-treating plant on the Chesapeake & Ohio at Powell Wye, Ohio, constructed by the W-M Corporation, Chicago

internal boiler pitting and corrosion through research and the determination of practical amounts of excess alkalinity to be carried in boiler water. (Boiler pitting and corrosion were reported in 1924 as costing the railroads $12,000,000 annually.)

(2) Reduction of scaling matter remaining in water treatment with lime—soda ash by the use of small amounts of sodium aluminate.

(3) Reduction of incrustation and after-precipitation in pipe lines, valves, water columns, branch pipes and injectors by the use of small amounts of recently developed complex polyphosphates and, in some cases, this material mixed with tannins.

(4) Reduction, and practical elimination in many territories, of intercrystalline cracking (caustic embrittlement), by taking advantage of the recommendations for using small amounts of sodium nitrate or suitable organic materials as developed in the research work at the Bureau of Mines under the direction of the Joint Committee on Boiler Feed Water Research. This research work, which was financed largely by the Association of American Railroads, has been actively participated in by A.R.E.A. representatives.

(5) Decrease in the amount of blowdown required, with consequent saving in fuel and increased availability of the motive power. By the use of special amide-type antifoam mixtures developed in the research laboratories of the water treatment specialty companies, foaming delays have been practically eliminated.

(6) Development and use of small, convenient conductivity sets, calibrated to read the concentration of boiler water salts direct on the dial. These have proved decidedly advantageous at terminals for checking the road blowing on inbound engines and to insure the dispatchment of locomotives with boiler water concentrations within workable limits.

(7) The recirculation of sludge in lime-soda plants, and refinements in plants of the sludge-blanket type, which provide effective means for lowering and controlling the hardness and scaling matter remaining in the treated water.

(8) The standardization of methods of water analysis and interpretation of results for raw, treated and boiler waters, which have been a decided asset in helping the railroad water chemist control the quality of the water delivered for locomotive use and the conditions in boilers.

Future Developments

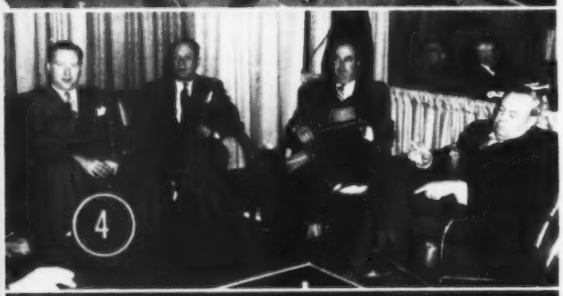
Diesel locomotives have brought water problems somewhat different from those encountered with steam power, but fully as important for efficient and economical operation. Water for cooling must be scale-free and rendered non-corrosive by treatment with compounds containing chromates, phosphates, soda ash or similar corrosion-inhibiting materials. The operating conditions in flash-type heating boilers are particularly severe, and distilled or demineralized water, with adjustments for protection against corrosion, has been found most satisfactory where scale-free, non-corrosive supplies are not available.

Future developments and problems to be handled in the conditioning of railway water supplies will probably be concerned with improvements in sludge recirculation and sludge-blanket lime-soda plants for large capacity installations, and with improved controls for the smaller wayside plants. Particular attention will be given to methods to be developed by research for determining and checking the tannin and organic materials used in water treatment, which are reported to have given good results in some cases. The new polyamide type of antifoam materials are now undergoing extensive tests, with their use being gradually extended, and these developments should be of interest in effecting improved operation with incident economies.

Water for Diesels

Work is progressing and studies are being continued for improving the water conditions on Diesel power units, which will undoubtedly result in further benefits. Improvement in hydrants and other equipment for handling drinking and culinary water to comply with U.S. Public Health Service orders, as well as improvements in equipment for waste disposal, are other subjects which are being given serious consideration, and further developments can be expected.

The record of water treatment on the railroads is one of great service. But vigilance needs to be exercised by all concerned in maintaining water treating facilities if continuing benefits are to be obtained. With the results of this work of direct concern to other railroad departments, close cooperation must be maintained with the operating and mechanical forces, as well as the forces in the engineering and maintenance-of-way departments.

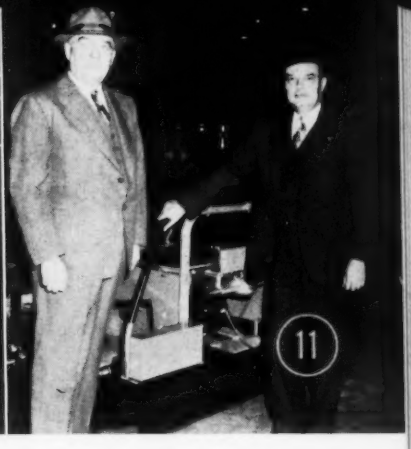


With a Roving C

(All names read left to right)

(1) Bird & Son, Inc.—John Crowe, D. H. Shoemaker (N.P.), S. H. Shepley (E.J. & E.), John H. Dooling. (2) Ingersoll-Rand Company—W. R. Bolte (K.C.S.), W. R. Walters (Ry. Bal. Con. Corp.), W. W. Boyer (P.R.R.), R. M. Buchanan (P.R.R.), M. E. Kerns (N.Y.C.), J. R. Adams (N.Y.C.), T. E. Weigand. (3) National Lock Washer Company—Dave Hallberg, Howard Stone, G. E. Webster. (4) American Fork & Hoe Company—R. J. Whalen, C. C. Connolly, J. J. Nolan, F. J. Reagan. (5) Railway Maintenance Corporation—R. M. Jenner, J. E. Mountford, E. J. Powell, J. J. King. (6) Woolery Machine Company—Walter Deckert (I.C.), W. C. Putzier (I.C.), R. J. Moe, D. Rutledge (I.C.), J. L. Turner (I.C.). (7) Rails Company—E. E. Martin (P.R.R.), L. T. Burwell, W A. Peck, J. V. Wescott, E. W. Caruthers (P.R.R.). (8) Homelite Corporation—Nelson Thompson, T. W. Gramm, P. R. Corbett. (9) Q & C Company—M. Iseldyke, L. E. Hassman, Lewis Thomas. (10) Nordberg Manufacturing Company—George Cooper, J. R. Graham, J. D. Bogard (I.C.), A. W. Munt (C.P.R.). (11) Fairmont Railway Motors, Inc.—W. F. Kasper, Kenneth Cavins. (12) P. & M. Company—R. D. Hawley, L. S. Walker, D. M. Clarke, W. J. Garrity, R. C. Schulze. (13) Chicago Pneumatic Tool Company—S. A. Congdon, Jr., W. G. Cowie (N.Y.C.), J. L. Brown, B. Warren (Chicago business man). (14) Reade Manufacturing Company—C. H. Reade, C. F. Reade, D. M. DeWitt, G. F. Carpenter. (15) Oxweld Railroad Service Company—D. H. Pittman, H. M. Overpeck (E.J. & E.), Lem Adams, H. R. Miller. (16) Woodings-Verona Tool Works—C. K. Luyster, R. F. Davis, W. H. Woodings, G. M. Snyder, R. J. McComb. (17) Cullen-Friestedt Company—J. F. Leonard, J. K. Huybers, E. V. Cullen, L. B. Bertaux, C. G. Edwards, C. J. Bronez.

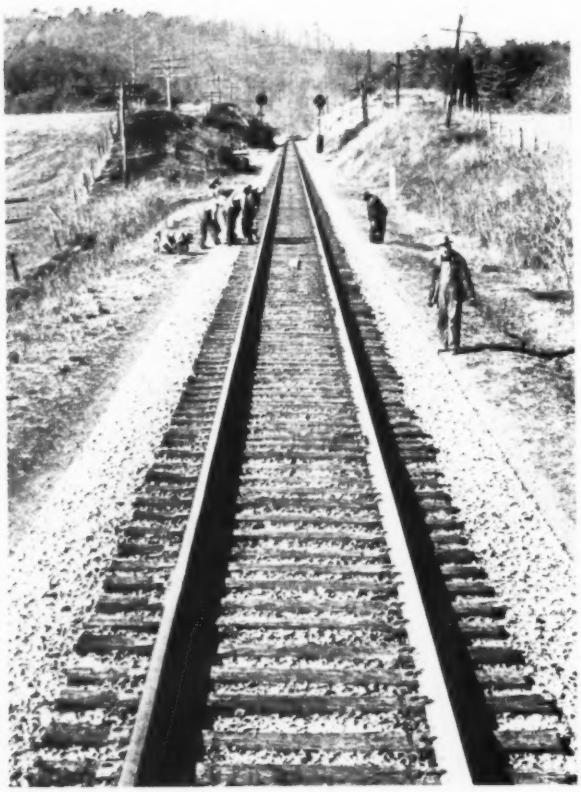
(See the Railway Age of March 26 for other views of the exhibit.)



Camera at the N.R.A.A. Exhibit

Scenes at booths of some of the manufacturers who displayed their products during the March meeting of the A.R.E.A.

Good Track Wins Cash for 83 Foremen



Above—The highest rated track on the Norfolk & Western, shown in this view, is maintained by C. E. Knight, section foreman, Concord, Va. Below—Double-track section to win highest rating is located near Higbys, Ohio. E. S. Detty is foreman

• Cash awards were made recently to 83 Norfolk & Western section foremen whose excellent work in maintaining their sections during the past year resulted in high ratings on their respective roadmaster's districts during the annual track inspection held last November. Each operating division and each roadmaster's district was also rated during the inspection.

The highest section rating for the entire system was won by C. E. Knight, main-line section foreman at Concord, Va. His section, in single-track territory between Lynchburg and Phoebe, received a score of 9.894 points out of a possible 10.000. The highest rating for double track—9.861 points—was won by E. S. Detty, section foreman at Higbys, Ohio, east of Chillicothe, on the line between Portsmouth and Columbus.

The 83 winners included those who placed first, second, third and fourth on each roadmaster's district on the main line and the more important secondary lines. On the less important districts and in terminals the number of prize awards was more restricted. The awards included 22 first prizes, 25 second prizes (because of ties), 18 third prizes and 18 fourth prizes.

Two roadmasters—E. S. Hughes, Crewe, Va., and H. E. Simmons, Sardinia, Ohio—tied for first place in the ratings awarded the roadmasters' districts, each having an average score of 9.80. The highest rating for main-line track among the operating divisions was won by the Norfolk division with a score of 9.79. The second highest division score was 9.76 points, awarded to the Radford division.

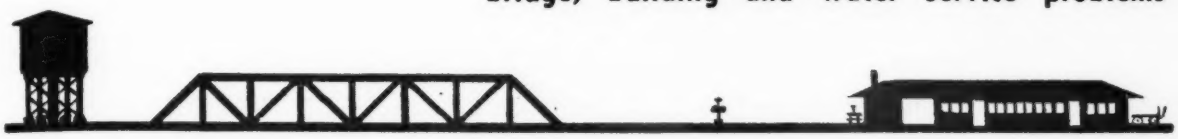
All of the N. & W.'s 22 roadmasters take part in the track inspection, during which they "tour" the railroad in a special inspection car equipped with a Sperry gyroscope device for detecting and recording track conditions, such as low joints, cross-level, line and surface.

The recordings of the gyro equipment account for 70 per cent of the total score on each territory. The remaining 30 per cent is determined by a visual inspection, made as the train passes, covering the condition of the roadbed, ditches, roadway, fences, road crossings and station grounds.

Track maintenance activities on the N. & W., including the annual inspection, are carried out under the general direction of J. W. Neikirk, manager of roadway maintenance, Roanoke, Va.

WHAT'S THE ANSWER?

An open forum for maintenance men on track, bridge, building and water service problems



Uses for Portable Telephones

What are the advantages of equipping track gangs with portable telephones? Are there disadvantages? How can such telephones be used most effectively?

Phones Promote Safety

By W. E. Cornell
Engineer of Track, New York, Chicago & St. Louis, Cleveland, Ohio

Track gangs should be equipped with portable telephones. They are devices for promoting safety as well as saving time in the performance of many items of track work and in making practically all motor car movements. Portable phones are inexpensive and little question can be raised regarding their economic justification.

Specifically, when jacking and surfacing track or occupying the main track with on-track machines that may be lifted off on short notice, much time can be saved in clearing for trains by keeping in touch with the operator or dispatcher by phone. Also, when necessary to occupy the main track with heavy trailer loads, or otherwise make the track temporarily unsafe for full-speed operation of trains, time may be saved, without jeopardizing the safety of the operation, by the use of portable telephones. All of this applies equally to the movement of men on motor cars to and from points of work.

The prevention of one accident would, no doubt, cover the cost of equipping many sections with portable telephones.

Advantages Are Numerous

By A. G. Reese
District Maintenance Engineer, Chicago, Burlington & Quincy, Galesburg, Ill.

The advantages of equipping track gangs with portable telephones are numerous, but the most important is the promotion of safety. The ability of a gang foreman to ascertain, by use of a portable telephone, the imminent movement of trains reduces the possibility of collisions or derailments, and their resultant casualties.

Progress on track work is expedited by communication between a foreman and a train dispatcher, and delays to trains are reduced by permitting the work to be programed so as to interfere the least with train movements. Information as to the performance of trains permits a foreman to take advantage of any time that may develop through a delay to a train before it reaches the site of the work. This is particularly true with steel gangs and other large outfits working on tracks carrying heavy tonnage at high speeds.

Telephone communication from the site of an emergency, such as a washout, often means a reduction of hours in the time required to restore the main line to service. Forces and material may be mobilized and movement to the scene started in less time than would be required to go to a telegraph station with a wire report. Delays to trains are often reduced through this prompt communication, since movement of trains to the section of obstructed track can be stopped and necessary detour arrangements formulated.

Delays in the movement of gangs to headquarters at the end of the work-day can be largely eliminated by telephone communication, and penalty over-time payments thus greatly reduced.

About the only objection to the use of portable telephones is their effect on the communication circuit. Their use often results in a noisy

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Answers to the following questions are solicited from readers. They should be addressed to the What's the Answer editor, *Railway Engineering and Maintenance*, 105 W. Adams St., Chicago 3, and reach him at least 30 days in advance of the issue in which they are to appear. An honorarium will be given for each published answer on the basis of its substance and length. Answers will appear with or without the name and title of the author, as may be requested. The editor will also welcome any questions which you may wish to have discussed.

To Be Answered In the June Issue

1. What methods should be employed to train men to operate power machines? What problems are involved? Explain.

2. What is the most effective and economical way to lower the roof lines and ceilings of old frame passenger stations to give them a modern appearance? Explain.

3. To what extent can multiflora-rosebush hedges be planted to form right-of-way fences? What are the advantages and disadvantages of such hedges for this purpose? Explain.

4. When constructing new bridge seats, is it better to bush-hammer them to final finish after 10 days to 2 weeks, or to elevation-finish them while the concrete is green? Why? Are there other effective methods? Explain.

5. What features are essential to a neat and clean toolhouse? How can interest in such toolhouses be maintained? What are the advantages?

6. What are the disadvantages of after-precipitation from treated water? How can it be controlled? Explain.

7. To what extent should a railroad employ outside architects or architectural firms to design or redesign passenger stations, shops or other large facilities? What are the advantages? The disadvantages, if any? Explain.

condition but improvements have eliminated most of this disadvantage. The use of block wires, where they are available, avoids interference with busy dispatchers' circuits. Connection with a communication circuit should be made only at the time the telephone is to be used, and should be severed when conversation is finished.

There Are No Disadvantages

By Maurice N. Heath
Section Foreman, Boston & Maine, Lisbon, N. H.

A constant source of contact between track crews and train dispatcher is a valuable asset to any railroad. A track crew equipped with a portable phone can have this contact at all times unless some disaster has occurred which has disrupted the communication wires.

It is universal practice on the Boston and Maine to equip track crews with portable phones. The advantages of this practice are innumerable. Even though it is mandatory for a section foreman or other responsible motor-car operator to obtain a morning line-up of trains to be run over the territory he will cover, no right to the track is thereby conferred to him. From time to time as he proceeds, he must either have further information from the train dispatcher or tower man, or else use valuable time, flagging. With a portable phone on his car he can ascertain in a matter of minutes if the way is clear to proceed. Also, if he finds some condition which makes a reduced-speed order immediately advisable, he can contact the dispatcher at once and have such an order put into effect; then he can take steps to correct the condition.

In C. T. C. territory it is very important to advise the tower man of any move contemplated by a track crew. This can be done readily and simply by the use of a portable phone. A portable phone is particularly effective during the progress of construction jobs or at washouts or wrecks. Constant contact can be maintained with division headquarters and periodic reports made as the work progresses.

Before placing his motor car on the track to return to headquarters, a track foreman must obtain information as to the locations of trains. Here again the portable phone proves its usefulness. In fact, in the opinion of the writer, there are no disadvantages whatever in equipping track crews with portable telephones.

Factors Involved in Doweling Ties

In ironing or doweling ties, when should the work be done—before, during, or after seasoning? What factors are involved? Explain.

Dowel Before Checks Appear

By C. D. Turley
Engineer Ties & Treatment, Illinois Central, Chicago

Ties manufactured from the so-called hardwoods, trees with broad leaves, have a tendency to check and split during the seasoning period. The time required for proper seasoning—10 to 15 months—depends very largely on the particular species of wood involved and the general climatic conditions encountered. Ordinarily, broad-leaf timber grown in swamp lands has a greater tendency to split than hill timber.

Shrinkage in wood takes place in conjunction with the loss of moisture during seasoning. The wood cells near the surface dry faster than those in the interior, and thus the outer portion shrinks while the interior does not. As a result, the resistance of the moist interior to the compression of the shrinking, dry, outer portion causes checks and splits in the sides and ends of ties.

Anti-splitting irons or dowels are applied to resist this checking and splitting, and obviously the applications should be made before the damage occurs. Some railroads iron all hardwood ties when they are stacked for seasoning, which should be within 30 days after the timber is cut and the ties are manufactured. Other roads use the so-called "selective" method. They iron only such ties as show indications of splitting at the time of stacking, and then make periodic inspections and apply additional irons as the condition of the ties indicates the need. Either method will prove satisfactory if given the necessary careful supervision.

Ridding the Right-of-Way of Weeds

Should weed control on the right-of-way (outside of the track area) be handled by contract or by company forces? Why? To what extent have new methods and equipment affected this situation?

Do Not Contract

By N. E. Peterson
Engineer Maintenance of Way, Chicago & Illinois Midland, Springfield, Ill.

We believe that weed control on the right-of-way (outside of the track area) can be handled most effectively by company forces. We have tried both methods and base our conclusion on personal experience.

Our practice is to make a minimum of three mowings a year and keep the right-of-way as clean and neat as the main state highway which parallels our railroad for a considerable distance. By using company forces and equipment it is possible to mow the right-of-way at the correct time and to complete the mowing of all sections by a definite date. This not only gives a uniform appearance over the system, but weeds are cut before they have had a chance to go to seed.

Under the contract methods we tried, it was not possible to effect the above control. Contractors for the most part were farmers adjoining our property, and mowing was handled only when men and equipment could be spared.

Mowing the right-of-way with company forces would not be practical were it not for modern, off-track, rubber-tired, tractor mowers. We have succeeded in making a considerable reduction in the amount of hand mowing required and are striving towards a further reduction. Widening of cuts and fills now permits off-track machine mowing right up to the ballast section on the major portion of our system. Steep cut and fill slopes which cannot be machine mowed are being planted in suitable ground cover which will prevent erosion, smother weeds, and present a neat appearance.

To facilitate machine mowing, rough areas on the right-of-way have been leveled, where practicable, by the use of bulldozers. Each year some location that is difficult to mow is improved.

On the elimination of brush and vines from fence rows we plan to experiment this year with the use of 2-4-D chemical. This has been made possible by the purchase of a suitable off-track sprayer. In addition to regular mowing, 2-4-D will also be used at a few locations on the right-of-way infected with perennial weeds.

Treated Window Frames and Sash

To what extent should exterior millwork, such as window frames and sash, be given preservative treatment before being used in the repair or construction of buildings? What types of treatment are best adapted? If used, where should this treatment be given? Explain.

Treat All Sash and Frames

By F. W. Gottschalk
Technical Director, American Lumber & Treating Co., Chicago

Nowadays, with the widespread use of second-growth forest products and the necessity to secure maximum maintenance-free life, all sash and frames should be treated. Second-growth wood has considerable sapwood which rots if moisture is present, and the heartwood is relatively non-durable.

The kind of treatment to use on sash depends upon the exposure and service life expected. This is best illustrated by the well-established creosote uses. For example, 8 lb. per cu. ft. of wood are specified for crossties, but 16 to 24 lb. are specified for marine piles where the hazard is greater. For sash in depots, dipping at a millwork factory in a penta and petroleum solution is satisfactory.

Sash for enginehouses and repair shops are subject to more severe decay than those in depots. Therefore, pressure treatment with chromated zinc chloride or other toxic salt preservatives approved by the American Wood-Preservers' Association are the best. Creosote is not recommended for this purpose because the wood cannot be painted and the oil is a fire hazard. In some railroad enginehouses and in plants that acid-pickle steel, salt-treated sash has been in service for over 15 years (and still does not need replacement), whereas untreated wood sash would last only 12 months.

Treatment Also Primes

By E. W. Ruddick
General Manager, Ponderosa Pine Woodwork Association, Chicago

In its simplest form, the answer to the question is that all exterior woodwork should be treated, regardless of the geographical area and the conditions surrounding the building in which the woodwork is to be installed.

It must be recognized that any material from which exterior doors, frames, and windows are generally made will deteriorate in various ways and in varying degrees, depending upon the intensity and combination of certain surrounding conditions, such as chemical-laden air, moisture, temperature, fungus, and insect attack. A given local condition, or combination of conditions, may affect one material one way, while another material may not be disturbed by it at all. Then, too, there is the variable reaction between types, or species, of the same material, as in the case of wood, and this fact is pertinent in answering the question. Since the species most widely used for the general line of woodwork is Ponderosa pine, my comments will pertain primarily to exterior woodwork products made from this type of material.

While there are a number of different types of wood preservatives, studies by the U. S. Department of Agriculture, plus the excellent experience of the stock millwork industry for more than 16 years, have led to the general acceptance of the chlorinated-phenol type of preservative treatment by this industry. Since exterior woodwork has been so treated, it is significant that no evidence has been found of failure due to decay or stain of any item that was treated in accordance with the industry's minimum standard requirements. As distinguished from the problems involved in the protection of wood in contact with the soil, the objective in treating exterior woodwork is to provide ample protection against fungus, stain, insect attack and dimensional change, without discoloring or impairing the finishing quality of the woodwork.

Regardless of the locality in which the woodwork is to be used it should be treated in accordance with the minimum industry standards as prescribed by the National Door Manufacturers' Association, and this should be specified in all purchase orders calling for exterior millwork. If this is done, there is no need to be concerned over its deterioration. All exterior woodwork should be treated with a quality wood preservative having a toxic and water repellent quality.

A coating or wood sealer is not sufficient protection for exterior woodwork. For this reason, the most adaptable, economical and effective preservative for exterior woodwork is one which penetrates and continues for some time to spread into the wood, even when applied by the non-pressure method, and which, after drying, fulfills the dual purpose of resisting fungus and insect attack, while at the same time retards changes in moisture content and dimensions without altering the basic properties of the woodwork or its ability to take a finish.

Thus, exterior woodwork should be treated to the extent of supplying suitable toxic and water-repellent protection for all such items, their component parts and their wood accessories. The extent of protection is dependent largely on the depth of penetration into the woodwork. In treating Ponderosa pine items, the generally used three-minute dipping process has proved satisfactory. Because of variation in the wood cellular structure, other species may require more or less time in the preservative bath. While the preservative pressure treating process involving heat affords the deepest and most thorough impregnation, the non-swelling, paintable type of preservative generally contains volatile, combustible oils, thus making this process objectionable because of the fire hazard. There are some pressure processes in which heating is not required. However, throughout the stock pine woodwork industry, the dipping method has been used exclusively.

Although a user of exterior woodwork can set up his own treating facilities and use any of the recognized quality wood preservatives, most people will find it more satisfactory and simpler to specify in their purchase order for exterior woodwork that is to be treated per NDMA standards. As all pine woodwork manufacturers using the industry standard preservative treatment are licensed and regularly inspected, the purchaser is assured of receiving such products properly treated.

It may be said that exterior woodwork treated within these standards is already partially primed for painting or finishing. As pointed out, the woodwork so treated is not just coated, for the preservative penetrates into the cells of the wood, filling them with the fungicide as well as with the water repellent oils, and tends to serve as a partial prime coat for subsequent finishing. However, if the woodwork is to be subjected to a bleaching process, it is inadvisable to treat the wood with a preservative. Therefore, with this exception, the water-repellent toxic preservative treatment not only protects the paint coatings by helping

to keep the wood dry beneath the paint film, but it also helps to maintain the dimensional stability of the woodwork—a highly desirable quality which assures easy and proper operation of doors, windows, etc.

Where it is necessary to cut into treated woodwork in order to install it, or to affix certain hardware items to it, it is advisable to apply immediately a liberal application of a penetrating wood preservative to those spots where cuts have been made. This is especially important where it has been necessary to cut across the grain of the wood, such as in the case of trimming the end of a door.

Since exterior woodwork, treated with a toxic water repellent preservative, possesses a number of advantanges in addition to being resistant to decay, it is a sound and economical building practice to specify your woodwork requirements accordingly, regardless of where the installation is to be made.

Water-Treatment Wastes

What problems are involved in satisfactorily disposing of the sludge from lime-soda ash water softeners, and the effluent from the regeneration of zeolite and demineralizing plants? How are these problems best solved? Explain.

Uses Dual Settling Basins

By Water Service Engineer

The problem involved in disposing of sludge from lime-soda ash water softeners is handled for the most part on my railroad by running the sludge into shallow ponds in which the sludge settles out and eventually dries. After drying, the sludge is removed and carted away. Two ponds are employed at each water softener location and are used alternately. Thus, after one is filled, the sludge is allowed to dry therein while the other is being used.

I might state here, that where the skepticism of farmers in receiving something for nothing is removed, they have found this sludge very beneficial in cultivating their land, especially where their soil is slightly acid. At some points we do emit the sludge from some softeners into ditches, streams and sewers, and to date have had no serious complaints from doing so.

We employ only three zeolite softeners, the effluent from the regeneration of which is discharged into sewer systems. After many years this practice has produced no adverse effects. Further, as far as I know, the effluent from the regeneration of zeolite softeners is not a problem. I know of many other zeolite softeners, some of large capacity, the effluent from the regeneration of which is discharged into city sewer systems without adverse effects. The effluent from others flows into streams without harmful effects.

We do not employ any demineralizing plants, and thus I cannot relate any personal experiences. However, I do know that in a large number of cases the effluent of the regeneration is discharged into sewer systems without any apparent detrimental effects. However, where the sewer system contains but a small amount of water flow, it is advisable to run the regeneration effluent from both the cation and anion units into a retention basin, thus accomplishing at least partial neutralization of the acids from the cation unit, and from there slowly admit it to the sewer system. It is also a requisite that the sewer or pipe line from any demineralizing plant that conducts the waste products to the main sewer or stream be constructed of tile or suitable acid-resistant material.

Disposal Methods Vary

By T. A. Tennyson
Chief Chemist, St. Louis Southwestern, Mt. Pleasant, Tex.

When lime and soda ash are used to remove calcium and magnesium (the soluble salts of which constitute what is commonly called hardness) from water, these two metals are precipitated as calcium carbonate and magnesium hydroxide. These compounds are white, insoluble solids that make up the major portion of the solid phase of the sludge from this operation. Usually the calcium carbonate is in greatest amount and there are other materials present, such as the oxides of iron and aluminum, silica, etc. This sludge, which is a slurry containing from about 2 to 10 per cent of solids suspended in the treated water, may be discharged from the softener continuously to keep its concentration in the softener below a fixed constant amount, or it may be removed at intervals in amounts of from 3,000 to 10,000 or more gal., depending upon the operation of the plant. This sludge is a waste product which must be disposed of, and the cost of its disposal must be figured into the operating cost of the softener. In some locations, disposal of the sludge involves so much cost and trouble that it prevents the use of the lime-soda ash softening process.

One method of disposing of this type of sludge is to discharge it directly into a ditch for subsequent washing to a stream, or to discharge it directly into a stream, but whether this method can be employed will depend on both the location and the stream. The sludge in ditches or the ground is unsightly and, from this standpoint, is objectionable in populated or improved districts. If the stream into which the sludge is discharged is not of sufficient velocity or volume, the sludge may pile up or cause enough increased turbidity to destroy beneficial plant and animal life.

Very careful study should be given to all factors involved before this method is used to avoid any possibility of stream pollution or public nuisance. If the stream is one of very high normal turbidity, the addition of the relatively small amount of sludge from a railroad water softener should do little harm if it is put into the stream in the proper manner. For best results the sludge line should extend to a point of high velocity in the stream, and it is desirable to use the continuous method of sludge removal.

If city sanitary or storm sewers are available and can stand the load, the sludge can be disposed of directly into them. In fact, lime-soda ash water softener sludge has been found to be of value in the operation of sewage-disposal plants by neutralizing acid sewage and helping to remove colloidal organic matter. Thus, a study of local conditions may reveal that the disposal of treating-plant sludge into the city sewer system may be of considerable value to the city. Where the practice of discharging sludge into city sewers is followed, straight lines and continuous flow have been found desirable.

Probably the most widely used method of sludge disposal is to run the slurry into a pond or basin. The solids settle to the bottom of the basin and the clear water soaks into the ground, evaporates, or is drained or pumped off to a ditch or stream, or to a gathering system for use. The basin or pond should be sufficiently large to hold enough sludge to make frequent cleaning unnecessary and to allow for the maximum amount of discharge to prevent carrying of the

slurry over the sides. In rural areas, if well water is hard, people sometimes like to get the soft water from the sludge basins for washing purposes. After a year or so of use, the pond or basin becomes full of the solid material, which must be removed and hauled away. Disposal may be made as fill or the material simply dumped in an out-of-the-way place where it will not cause stream pollution or be a nuisance.

Much thought has been given to finding a use for lime-soda ash water softener sludge, both from the possibility of realizing a cash return from it and to get rid of it with the least amount of trouble and expense. Some large municipal and industrial plants produce several tons of this material daily and its disposal presents a real problem. Since its main ingredient is usually calcium carbonate, the sludge, properly purified and handled, should find a use in paper and paint manufacture, as well as in the sweetening of land for agricultural use. There are large plants which are set up to dewater the sludge, dry it, sack it, and sell it for these various uses at a profit to the plant. Some plants are of such size and location as to make it profitable to burn the sludge to produce lime. Since the sludge contains calcium carbonate from all of the lime used, plus calcium carbonate from the calcium content of the water being treated, these plants can more than supply their own lime needs by calcination of the sludge. Unfortunately, this process requires expensive machinery and, so far, production of lime at water softeners has not been considered economically feasible where the amount of sludge per day is less than about five tons. Most railroad plants are not of sufficient size to make this operation pay.

At some locations, farmers in the vicinity of lime-soda ash water softeners will haul away a portion of the partly dried sludge for use in sweetening land. However, since it is heavy, and presents some difficulty in handling, only a few farmers will take the sludge, even though it is free and they may need it. Possibly, if the sludge were spread out on sand beds where it could have its small entrained caustic - soda content leached out by rain, and then could finally dry, it would be more popular. County agricultural agents might help with the problem.

Zeolite water softeners remove calcium and magnesium from water as an insoluble material by combining these metals with the zeolite bed mineral in place of its sodium content. When all of the sodium has been replaced by calcium and magnesium, the zeolite bed cannot soften any more water until the calcium and magnesium are replaced by sodium and removed. This is accomplished by soaking the bed in a 5 to 15 per cent solution of common salt during the cycle known as regeneration. In this cycle the zeolite bed is returned to its original state, without loss of itself, and the resulting calcium chloride and magesium chloride are removed by washing with water. This wash water will contain calcium and magnesium chlorides and some left-over sodium chloride in the amount of less than 15 per cent, and its disposal is relatively simple.

Effluent, or wash water, from the regeneration of zeolite water softeners can be run directly to sanitary or storm sewers without harm, provided these sewers can carry the volume of water. Dumping the brine into a stream should not cause any trouble unless the volume of other water carried by the stream is very small and the effluent from the zeolite plant will increase the total chloride content of the water to more than 5,000 parts per million.

Demineralizers are operated in multiple stages to remove both the metal ions and the acid ions from water to produce water similar to distilled water. When the beds are spent, the bed which removed the metal ions must be regenerated with acids and the bed which removed the acid ions must be regenerated with alkaline materials. The wash water from both beds contains salts similar to those from ordinary zeolite plants and in about the same concentration. Effluent, or wash water, from demineralizers can be disposed of satisfactorily in the same manner as that from zeolite plants.

The present impetus toward prevention of stream pollution will necessitate consideration of the satisfactory disposal of all waste materials. Such consideration will undoubtedly result, as it has in the past, in better methods of disposal, conservation practices, and in recovery of valuable materials now being lost, which will in some cases more than compensate for the effort.

Types of Low-Level Platforms

What types of low-level platforms are best suited for use at small passenger stations, from the standpoints of cost of installation, economy of maintenance and satisfactory service? Explain.

Decomposed Granite is Good

By L. C. Hixsch
Chief Carpenter, Chicago, Milwaukee, St. Paul & Pacific, Green Bay, Wis.

A concrete platform is the most economical from the standpoint of economy of maintenance and satisfactory service, particularly in snow country, such as we have on the Superior division of the Milwaukee, although the cost of installation is usually prohibitive elsewhere. Where we have to handle a lot of mail, express and baggage in winter, a concrete platform has proved to be the most satisfactory because snow is easily removed from it with a mechanical broom or snow plow, or by hand if necessary. Furthermore, if the surface is icy, it can be sanded to prevent slipping.

At smaller stations where a good platform is necessary, but at which only one or two trucks of mail, express and baggage are handled, and pasenger traffic is light, I have found that a decomposed granite platform is very good. We construct our platforms of this kind with a creosoted-wood curb to the height of the top of rail and fill with cinders well tamped to about two or three inches below the top of the curb, then place a layer of decomposed-granite screenings on the cinders to the top of the curb. The granite must also be well tamped.

This type of platform is not affected by frost and lends itself to easy snow removal by mechanical broom, plow or shovel. However, some annual maintenance is necessary to keep low spots filled and tamped as they develop. This is important, for if they are not kept up this type of platform will be a failure. This maintenance usually requires about 15 to 30 min. work for one section laborer about three or four times a year, and a small stock pile of the decomposed granite to draw on for these repairs.

I dislike a cinder platform from the standpoint of appearance, and it usually requires a lot of maintenance in summer or winter. Timber platforms also are objectionable in snow country because the planks heave in winter and pull the nails loose which, if not watched, will create a hazard by eventually sticking up above the

plank. The planks also wear out, requiring that the platform be repaired frequently. My final objection is that snow is hard to remove from a timber platform.

Type Dependent on Use

By C. K. Scott
Engineer Maintenance of Way, Erie, Jersey City, N. J.

Based on our experience with low-level platforms at small passenger stations, we feel that it is necessary to consider the use and traffic on such platforms when considering the type best suited.

Shelter houses, which are the smallest of all passenger stations, can be served by platforms constructed of cinders rolled to a smooth surface and edged with a treated timber curb. Necessary drainage must be provided. At wayside or local stations that require more substantial platforms, adequate drainage should first be provided. These platforms should consist of treated timber curbs, retaining either a cinder or crushed stone base, well rolled and covered with an asphaltic coated stone, amiesite or all-weather bituminous concrete (black top) surface. This meets normal requirements at low cost.

This type of construction, using a crushed stone base for heavy duty platforms, is desirable from the standpoint of ease of application and is comparable in service to concrete. Furthermore, it is much more economical to maintain than concrete, providing the base and black top surface are correctly applied.

Most railroads have mechanized equipment that permits low-cost construction and economical maintenance of low-level passenger station platforms of this character with their own forces.

Species of Wood for Dolphin Piles

What species of wood, when treated, are effective for use as piles in dolphins and pile clusters protecting bridges, wharves, ferry slips, etc.? What characteristics are desirable for such piles? Explain.

Douglas Fir on West Coast

By Franz M. Misch
General Bridge and Building Supervisor, Southern Pacific, San Francisco, Cal.

If this question were put to a west-coast railroad man, he would reply immediately that, for economy, maximum service life, and quick supply, he would use Douglas fir of the Pacific-coast species, treated by the full-cell process with straight creosote oil, with final retention of approximately 14 lb. of creosote per cubic foot of timber.

He would further specify that the Douglas fir piles must be stripped of bark, straight, and must not deviate from true line more than 1-in. per 10 lin. ft. Tips should be not less than 9 in. in diameter. Butts should be not less than 14 in. or more than 20 in. in diameter. All limbs and knots should be cut flush, and all piling should be free from large knots, wind shakes, falling checks, rot or other defects. Reasonably close grain would be expected, especially in second-growth fir. Five to six annual rings per inch, measured radially on the outer 3 in. of the butt, is satisfactory.

One defect sometimes overlooked, but of specific importance in cases of hard driving, is the twist of the grain. A twist of one-half the circumference in a 20-ft. length of pile should be the maximum allowed.

Other species of timber have been used for piling. Cedar, southern pine, cypress, spruce, tamarack and oak are sometimes available from local supply and have given satisfactory service life. Untreated cedar piles have given remarkable service in some locations, but are now in limited supply on the west coast.

Reports on the use of untreated Greenheart piles indicate that long service life, free from marine borer attacks, can be expected. However, this type of piling is not available in many locations and the cost of securing it may be prohibitive.

Local supply and length of pile required are sometimes the determining factors. Short piles can be obtained from many species, while piles 100 to 150 ft. in length can be obtained readily from Douglas-fir suppliers. Some consideration should be given to the advisability of splicing piles from an economy standpoint. Pipe sleeve splices have proved satisfactory for bearing piles, and with good design should be satisfactory for dolphin piles.

A recent experiment was tried to give more flexibility and less pile breakage in dolphins and ferry slips. The piles were driven butt down, resulting in a larger pile diameter at the mud line. Standard methods of chocking and bracing were used. However, in cases of diagonal sheathing on ferry slips, sheathing was spiked to fillers between the piles to reduce damage to the treated creosote piles. To date this experiment has proved satisfactory.

In protecting major bridges and important wharves, at which damage to navigation would be small in comparison to possible damage to the structures, consideration should be given to the use of a permanent type of construction. Reinforced-concrete cellular protection work, supported on reinforced-concrete piles, can be designed and constructed to give the required protection free from further maintenance. This design was used on a large, recently-constructed docking wharf, together with heavy coil springs to absorb docking impact. As always, however, consideration must be given to first cost, maintenance costs and service life.

Treatment May Not Be Needed

By P. Sobbott
Division Engineer, Erie, Jersey City, N. J.

Since there is no infestation by marine borers of the waters of the New York harbor area, the treatment of piles for dolphins and pile clusters is not required, The depth of water in the harbor varies from about 20 to 35 ft., with silt averaging in depth approximately 50 ft. All piles, therefore, are friction piles with a large leverage because of the low resistance of the silt.

The marine equipment used is heavy, consisting of large tugs, car floats and heavy ferries. It has been our experience that it is not economical to use treated piles, because piles often break off at the mud line or crush, and their full life is seldom realized. It is our practice, generally, to use untreated, yellow-pine piles in the center of clusters with untreated oak piles on the outside. We follow this on dolphins where the usage is not severe, but where these dolphins are subject to heavy duty we have used Greenheart piles protected on the outside by untreated oak.

It is our opinion that the treatment of piles is economical only where they are not subject to severe use and where they can be adequately protected from heavy blows and abrasion by marine equipment. However, where marine borers exist, heavy treatment is required.

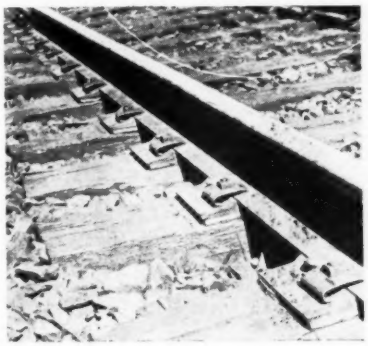
PRODUCTS OF MANUFACTURERS

New, improved equipment, materials, devices

(For additional information on any of the products described in these columns, use postcards, page 355)

BIRD TIE PAD IMPROVED

BIRD & Son, Inc., East Walpole, Mass., has made improvements in the pad it manufactures for application between tie plates and ties, which is designed to extend tie life



An installation of Bird tie pads under 8 in. by 11 in. tie plates on the low side of a curve

and reduce the cost of maintaining track line and surface. The tie pad extends tie life, it is said, because, forming a tight seal between tie and pad, it eliminates motion against the wood and excludes dust and other abrasives from between the plate and the tie; and being water resistant, it keeps the wood under the plate and around the spikes comparatively dry.

According to the manufacturer the tie pad has a resiliency sufficient to cushion some of the shock to the ties and thereby helps to prevent tie displacement and disintegration of the ballast. It is said that the pad preserves the wood under tie plates to such an extent that its original strength is maintained. This factor, it is claimed, combined with the virtual elimination of mechanical wear, permits the use of smaller tie plates without damage to the ties.

The Bird tie pad is made of alternate layers of heavy cotton duck and a specially woven burlap, impregnated with mildewproofing and waterproofing saturates and laminated together with thin films of modified asphalt. The pad is then stapled from both sides with solid bronze staples to avoid possibility of ply slippage, and the entire pad is coated with a highly modified bituminous coating. The pad is made in a ¼-in., 5-ply thickness, and a ⅜-in., 7-ply thickness, in all tie plate sizes.

NORDBERG T-WRENCH

THE Nordberg Manufacturing Company, Milwaukee, Ws., is introducing a socket wrench with a long

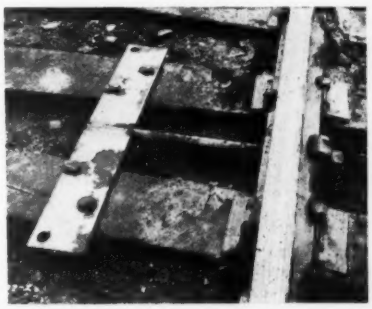
Tightening lag screws of a timber guard rail on a bridge with the Nordberg T-Wrench

T-shaped handle, by means of which the many bolt and lag-screw-tightening jobs encountered in track-maintenance work may be accomplished in a comfortable standing position. The socket, of heat-treated alloy steel and detachable from the handle, is available in several different sizes. The top of each socket is made to take an open-end wrench when additional tightening power is necessary.

RAIL HOLDER STRENGTHENED

FURTHER improvements in the Morrison Adjustable Rail Holder, to provide an overall gage-holding strength equal to that of the component parts of the device, have been announced by the Morrison Railway Supply Corporation, Buffalo, N. Y. The rail holder consists of a wing plate, designed to be fastened to two adjacent ties, a tension rod threaded at one end and welded to the wing plate at the other end, and a jaw casting which fits over the base flange of the rail and which is pulled tight against the rail by an adjusting nut at the end of the tension rod.

In the improved gage holder the wing plates have been increased in width to 6 in., and a better type of locking nut has been adopted, by means of which very minute adjustments are said to be possible. Furthermore, the manufacturer no longer insists that, for satisfactory service, the wing plates be fastened to the ties by screw spikes or lag screws only; either the ⅝-in. or 9/16-in. cut track spike may be used.



A Morrison Adjustable Rail Holder on a heavy-traffic curve

The rail holders, when applied to curved track or turnouts according to recommended patterns, are said to supply sufficient holding power to resist excessive lateral pressures in the track due to normal train operation.

HOUGH PAYLOADER—A CORRECTION

THE Model HM Payloader manufactured by the Frank G. Hough Company, Libertyville, Ill., which was described in the March issue, is driven by an engine with a rating of 76 hp. It was erroneously stated in the March issue that it has a 7-hp. engine.

WEED KILLER

THE General Chemical Division, Allied Chemical & Dye Corp., New York, is offering a weed killer, known as formula 7B-D, which is available in 50-gal. drums. This material is especially designed for application by low-pressure knapsack sprayers or power spray rigs to weed growth in the vicinity of yard tracks, industrial spurs, bridges or pole lines. One drum is said to treat 2½ acres.

The weed killer is a toxic aromatic oil containing a high concentration of trichloroacetic acid, pentachlorophenol, and 2, 4-dichlorophenoxyacetic acid. It is diluted at point of use with crude fuel oil, Diesel fuel oil, or kerosene, in the ratio of 1 to 8 or, for less resistant types of weeds, 1 to 12. It is said to kill all types of vegetation and to suppress new seedling growth. The user is cautioned by the manufacturer to avoid drifting of spray to cultivated vegetation.

RAIL-JOINT PACKING

A NEW RMC Rail Joint Packing incorporating a number of improvements has been announced by the Railway Maintenance Corporation, Pittsburgh, Pa. It is made in block form of vermiculite, heavy asphalt oil and inhibitors. Vermiculite, which is non-hygroscopic and inert chemically in the presence of water, is said to have antifriction qualities comparable to graphite, an important feature in reducing wear between the bearing surfaces of the splice bar and the rail. The blocks of packing are wrapped in a new type of paper which disappears rapidly after the initial installation of the packing.

When installing the material the blocks are placed on the joint bar and tamped firmly into place. After the joint bars are applied and the bolts tightened, the excess material at the ends of the bar is rammed behind the bar and shaped off at the ends to provide additional protection at the base of the rail.

RMC packing is also made in a mixture of lighter consistency, which can be used for the protection of switch plates, rail, and exposed surfaces on the top of bridge decks, and of girders or web plates where ashes or other corrosive materials may be retained. This packing may be troweled or brushed onto the surface. When exposed to the atmosphere it forms a heavy, leathery surface which prevents the penetration of excessive moisture.

New Book

R. E. & M. CYCLOPEDIA

EDITED by Neal D. Howard, editor of *Railway Engineering and Maintenance* and western editor, Railway Age, and R. E. Dove, managing editor, formerly assistant engineer, Chicago, Milwaukee, St. Paul & Pacific, assisted, as consultants, by George M. O'Rourke, assistant engineer maintenance of way, Illinois Central (Track section); A. E. Bechtelheimer, bridge engineer, retired, Chicago & North Western (Bridge section); the late Clarence R. Knowles, superintendent of water service, retired, Illinois Central System (Water Service section); and A. L. Essman, chief signal engineer, Burlington Lines (Signal section). 1220 pages, 1400 illustrations, 9 in. by 12 in. Bound in maroon fabrikoid. Published by the Simmons-Boardman Publishing Corporation, 105 W. Adams street, Chicago 3. Price $8.

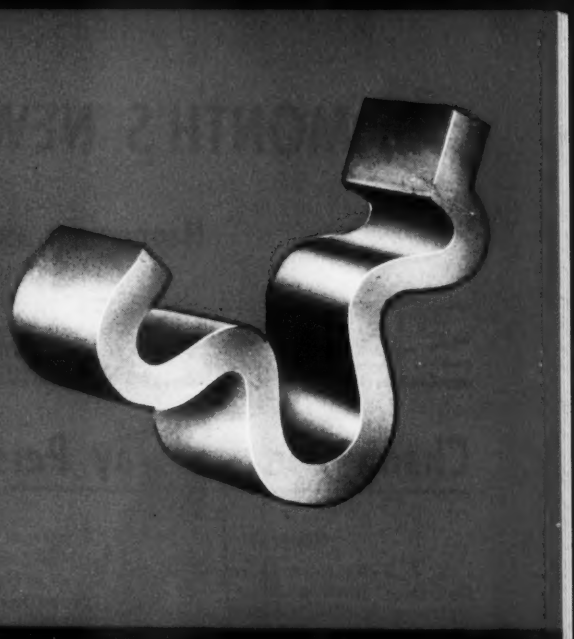
The 1948 edition of the Railway Engineering and Maintenance Cyclopedia is the seventh edition of a publication which for more than 28 years has been accepted and approved as the outstanding guide to efficient maintenance-of-way and structures practices. It has been thoroughly revised and rewritten by railroad men, in cooperation with the American Railway Engineering Association and the Signal section of the Association of American Railroads, so that more than 30 per cent of the text is new. This book deals authoritatively, and yet concisely, with all matters pertaining to railway engineering, maintenance of way and structures, and signaling, and is essentially six volumes in one, including within its pages technical and practical data that are now available only in scores of books and hundreds of magazines, reports, pamphlets, and manufacturers catalogs.

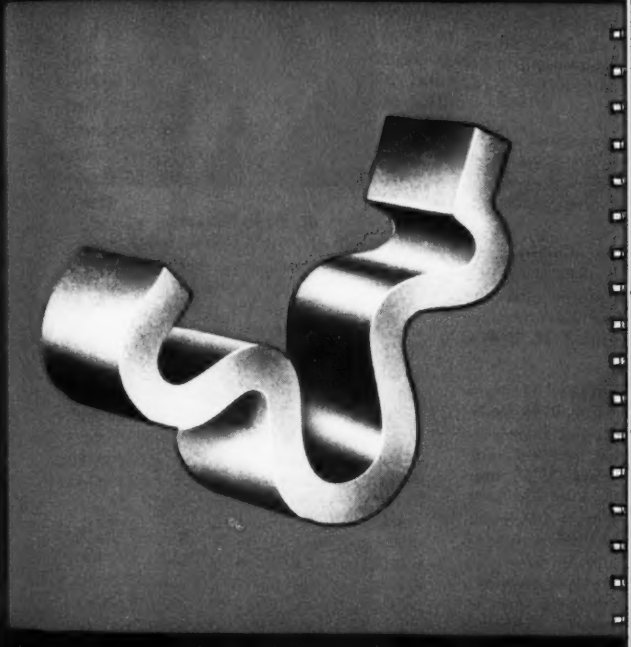
Specifically, the new edition includes descriptions of the latest methods, power and hand tools, work equipment, devices, appliances and materials now in use in the maintenance-of-way and structures field, which are closely coordinated with almost 300 manufacturer's catalog pages. The latter are devoted to detailed descriptions and specifications of products related to the railroad industry.

The seventh edition is divided into six sections, five of which pertain to specific phases of railway maintenance, while the sixth deals with tools, equipment and other products which are common to the other five. The Track section includes 24 chapters covering every phase of track construction and maintenance, with detailed discussions on the latest work equipment and approved practices for carrying out the work. The Bridge section has 16 chapters devoted to bridge construction and maintenance, including recent developments in concrete mixtures, wood and steel bridges, preframing, turntable conversions, and protective coatings. The Building section, with 23 chapters, embraces the wide field of building construction and maintenance of shops, servicing facilities for steam and Diesel locomotives, passenger and freight stations, power plants, and the lighting, heating and ventilating of these and related facilities. The Water Service section, in seven chapters, deals with the importance of securing good water for drinking, steam, and cooling purposes and includes particulars on the sources of supply, pumping equipment, meters, pipe lines, and storage and servicing facilities. The Signal section contains 18 chapters of the latest information on all-relay interlocking, centralized traffic control, spring switches, coded track circuits, and a general discussion on high-frequency and space-radio systems, in addition to the basic fundamentals of signaling and signal rules. For ready reference, four indexes are appended to this volume and are divided into a general subject index, a directory of products, a trade name index and an alphabetical index of manufacturers.

ONE PIECE! TWO EQUAL GRIP JAWS—One on each side of rail base.

WIDE STEEL SECTION reduces possibility of derailed wheels punching anchor thru rail base. Dragging equipment has little or no effect on this anchor. The design offers little for equipment to come in contact with.





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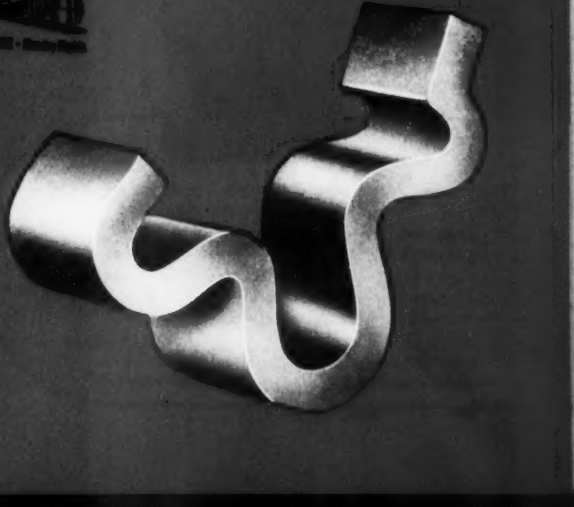

THE MONTH'S NEWS

Happenings among the railways—the associations—the suppliers

Changes in Railway Personnel

General

H. L. Exley, division engineer of the Baltimore division—West End of the Baltimore & Ohio, has been promoted to assistant to general manager, with headquarters as before at Baltimore, Md.

Alfred D. Wolff, Jr., research engineer of the New York Central at New York, has been appointed assistant vice-president, with the same headquarters.

Engineering

Floyd R. Smith, whose promotion to chief engineer of the Union, with headquarters at East Pittsburgh, Pa., was announced in the February issue, was born at Joliet, Ill., on August 15, 1902, and received his B.S. in C.E. degree from Carnegie Institute of Technology. He entered railroad service in July, 1922, as rodman on maintenance and construction work with the Elgin, Joliet & Eastern and held various positions on construction projects related to grade separation, double tracking and revision of grade until April, 1928, when he became assistant engineer, engaged in

Floyd R. Smith

analyzing cost data for valuation purposes. Mr. Smith went with the Union in February, 1930, as assistant engineer at Pittsburgh, engaged in cost data work for federal valuation. He was appointed chief draftsman in the maintenance of way department in November, 1937; engineer of bridges in August, 1940; engineer of bridges and buildings in May, 1941; assistant chief engineer in charge of bridges and buildings in July, 1942; and assistant chief engineer in January, 1947.

George F. Hand, assistant to the chief engineer of the New York, New Haven and Hartford, with headquarters at New Haven, Conn., retired on March 1 after 43 years service.

H. L. Riser has been appointed assistant division engineer on the New York Central, with headquarters at Columbus, Ohio, succeeding **G. W. Deblin,** transferred.

E. M. Richardson, instrumentman on the Illinois Central, has been promoted to assistant to division engineer on the Illinois division, with headquarters at Champaign, Ill., succeeding **J. M. Tilley,** deceased.

Charles W. Reeve, engineer of track of the Delaware & Hudson, with headquarters at Albany, N.Y., has been promoted to division engineer of the Champlain division at Plattsburg, N.Y., succeeding **C. E. R. Haight,** who has been transferred to the Saratoga division, where he replaces **J. C. Dorsey,** whose death is reported elsewhere in these columns. **R. J. D. Kelley** has been appointed assistant construction engineer at Albany, succeeding **Joseph C. Brennan,** who has been promoted to engineer of track to replace Mr. Reeve. These appointments were effective March 1.

Hugh W. Johnson, whose appointment as assistant chief engineer of the Chicago Great Western, at Chicago, was reported in the February issue, was born on March 2, 1912, at Atlanta, Ga., and attended the Alabama Polytechnic Institute. He began his railroad career on December 31, 1936, as a rodman on the Southern, and advanced to Junior engineer in January, 1941. During World War II Mr. Johnson served with a railway operating battalion in India, returning to the Southern in February, 1946, as assistant engineer at Cincinnati, Ohio, which position he held until his recent appointment as assistant chief engineer for the C.G.W.

C. Paul Schantz, whose appointment as assistant to the chief engineer of the Eastern region of the Pennsylvania at Philadelphia, Pa., was reported in the

C. Paul Schantz

February issue, was born in Bucks county, Pa., on April 3, 1893. Mr. Schantz received his mechanical engineering degree from Drexel Institute of Technology in 1912, entering railroad service in October of that year as chainman in the chief engineer's department of the P.R.R. From June, 1928, until November, 1941, he served successively as draftsman, supervising draftsman, designing engineer, office engineer and assistant engineer of bridges. In November, 1941, Mr. Schantz was appointed assistant chief engineer, maintenance of way, of the Eastern region, at Philadelphia, which position he held until his recent appointment.

Russell A. Shier, assistant division engineer of the Belleville division of the Canadian National, has been promoted to division engineer of the Hornepayne division, with headquarters at Hornepayne, Ont., effective February 15.

C. F. Parvin, assistant division engineer of the Philadelphia Terminal division of the Pennsylvania, with headquarters at Philadelphia, Pa., has been promoted to division engineer of the Wilkes-Barre division, at Sunbury, Pa., succeeding **J. H. Schilling,** who has been granted a leave of absence pending his retirement. **C. H. Kooser,** supervisor of track on the Eastern division at Mansfield, Ohio, has been promoted to assistant division engineer of the Philadelphia Terminal division, succeeding Mr. Parvin. **D. A. Leisher,** master carpenter at Baltimore, Md., has been appointed assistant engineer in charge of the drafting room on the Maryland division.

(*Please turn to page* 404)

Here's that new crane you're paying for

If you own an old steam locomotive crane, you are probably signing checks every month that could easily pay for a brand new AMERICAN DIESELECTRIC. Would you rather have the new crane, or the cancelled checks?

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Railway Personnel (Cont'd)

Frederick L. Thompson, assistant division engineer of the Ohio division of the Baltimore & Ohio, with headquarters at Cincinnati, Ohio, has been promoted to division engineer at Wheeling, W. Va., to succeed **Frank W. Bailey,** who has been transferred to the Baltimore division, at Baltimore, Md., where he replaces **H. L. Exley,** whose promotion to assistant to general manager is noted elsewhere in these columns. **A. O. Huber,** assistant engineer-office, in the office of the engineer maintenance of way of the Western region, Cincinnati, succeeds Mr. Thompson as assistant division engineer of the Ohio division, and **R. O. Cassini,** assistant on the engineering corps, has been appointed assistant engineer-office at Cincinnati at replace Mr. Huber.

Col. A. L. Bartlett, whose retirement as assistant to the chief engineer of the New York, New Haven & Hartford at New Haven, Conn., was reported in the March issue, was born at Claremont,

Col. A. L. Bartlett

N.H., on November 22, 1884, entered railroad service in 1909 as transitman and resident engineer on the Northern Pacific, served as a surveyor with the U.S. Engineers, and joined the New Haven in 1912 as a transitman. In 1914 he was promoted to assistant engineer, and became track supervisor in 1915. From 1917 to 1919 Col. Bartlett served in the armed forces, and in 1920 he returned to the New Haven as assistant division engineer. He was promoted to division engineer in 1923, and to maintenance engineer in 1930. In 1931 he was advanced to engineer maintenance of way and was further promoted, in 1947, to assistant to the chief engineer, the position he held at the time of his retirement.

Stanley G. Phillips, whose appointment as chief engineer of the Boston & Maine, the Maine Central and the Portland Terminal Company, with headquarters at Boston, Mass., was reported in the March issue, was born on February, 26, 1895, at Westbrook, Me., and was graduated from the University of Maine in 1917. He entered the service of the Lehigh Valley as a rodman in 1917 and, after serving overseas with the United States Army Engineers from 1917 to 1919, he returned to the Lehigh Valley,

Stanley G. Phillips

serving successively as assistant division engineer and track supervisor. In 1929 he was appointed track supervisor of the Central of New Jersey. Mr. Phillips entered the service of the Boston & Maine in November, 1929, as assistant division engineer of the Terminal division in Boston, and in 1939 he was promoted to division engineer of that division. He was promoted to engineer maintenance of way of the Maine Central and the Portland Terminal on April 15, 1942, and held these positions until his recent promotion.

Frederick H. Lovell, whose appointment as engineer of bridges and buildings of the Central region of the Pennsylvania, with headquarters at Pittsburgh, Pa., was noted in the March issue, was born in England and received his early education in London. He attended H. M. Dockyard Technical Institute at Portsmouth, graduating in 1913, and took a post-graduate course at Kings College, London. He came to

Frederick H. Lovell

this country in 1920 and served with the Bethlehem Steel Company and the Treadwell Construction Company until 1924 when he became a draftsman in the office of the engineer of bridges and buildings of the Pennsylvania at Pittsburgh. Mr. Lovell was promoted to senior draftsman in 1928 and was further advanced to designing engineer in 1941. He became assistant engineer of bridges and buildings in 1942, and held this position until his recent promotion.

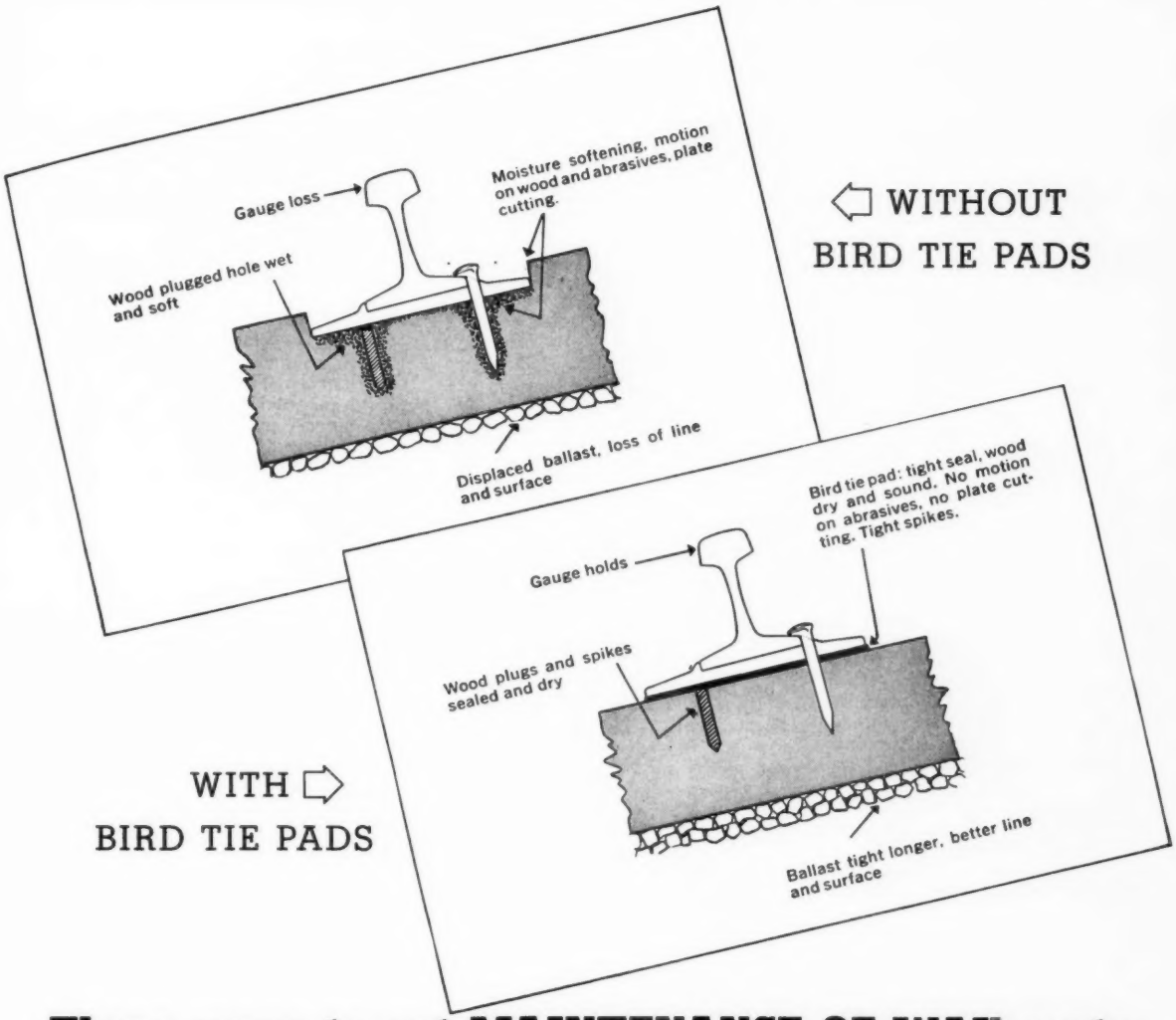
James W. Wiggins, whose appointment as engineer maintenance of way of the Maine Central and the Portland Terminal Company, with headquarters at Portland, Me., was announced in the March issue, was born at Houlton, Me., and was graduated in 1930 from the University of Maine. He entered railway service that same year on the Erie and, in 1933, went with the Bangor & Aroostook as a rodman. In 1936 he went with the Maine Central as assistant engineer, returning to the Bangor & Aroostook as superintendent of bridges and buildings in 1938, and was promoted to principal assistant engineer of that road in 1940. He resigned in 1945 to go with the Boston & Maine as assistant to the chief engineer which position he held until his recent promotion.

James W. Wiggins

R. F. MacKenzie, who was recently appointed assistant division engineer of the Campbellton division of the Canadian National, at Campbellton, N.B., as announced in the January issue, was born in Edmundston, N.B., and served briefly on the Centerville subdivision of the Canadian National as a section laborer before being advanced to instrumentman in 1945. In the latter capacity he was assigned to Campbellton, where he remained until his recent promotion.

L. P. Urquhart, whose promotion to assistant to the chief engineer of the Denver & Rio Grand Western at Denver, Colo., was reported in the February issue, was born on January 28, 1909, at Midvale, Utah, and entered railroad service with that road on October 26, 1930, as a locomotive fireman. In July, 1942, he was advanced to locomotive engineer on the Salt Lake division, and in September, 1944, to trainmaster, with headquarters at Salt Lake City, Utah. Mr. Urquhart was transferred to Alamosa, Colo., as trainmaster in December, 1947, and held this position at the time of his recent promotion.

(Please turn to page 406)


Gauge loss
Moisture softening, motion on wood and abrasives, plate cutting.
Wood plugged hole wet and soft
Displaced ballast, loss of line and surface
WITHOUT BIRD TIE PADS
Gauge holds
Bird tie pad: tight seal, wood dry and sound. No motion on abrasives, no plate cutting. Tight spikes.
Wood plugs and spikes sealed and dry
Ballast tight longer, better line and surface
WITH BIRD TIE PADS

Three ways to cut MAINTENANCE OF WAY costs

By extending tie life . . . Bird Tie Pads form a water resistant, tight, dustproof seal on the wood under tie plates and around the throats of spikes. The wood stays dry and sound. Abrasive wear and plate penetration are eliminated.

By reducing labor *required to maintain gauge, line and surface* . . . the resiliency of Bird Tie Pads cushions impacts and lessens disintegration and displacement of ballast. Gauge is helped by the tight seal which eliminates mechanical wear and spike hole deterioration. Spikes retain their holding power in dry wood.

By making smaller tie plates possible . . . there is plenty of strength in most new cross ties to carry the greatest loads with smaller tie plates. Bird Tie Pads introduce a new factor . . . they preserve this original strength by keeping the wood dry and sound. This makes the use of smaller tie plates with Bird Tie Pads thoroughly practical . . . actually better than larger plates without pads.

Net savings on cross tie bills from tie life extension alone will usually run in the order of 20 per cent . . . more on expensive bridge and switch ties, and fast wearing points such as sharp curvature. Savings on smaller tie plates and line and surface are in addition.

The above statements are based on ten years of in-track experience and research. We believe they are justified by the facts which we have developed. Let us tell you about this important development. Write Bird & Son, inc. 10 Birch St., East Walpole, Mass.

BIRD TIE PADS

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Railway Personnel (Cont'd)

B. F. Keays, who was recently promoted to assistant division engineer of the Moncton division of the Canadian National, with headquarters at Moncton, N.B., as noted in the January issue, was born at Matapedia, Que., and entered railway service in 1939 as a timekeeper in the track department of the C.N.R. at Newcastle, N.B. Shortly thereafter he left the railroad, but returned the following year as a timekeeper on the Harcourt division. In 1945 he became a draftsman at Campbellton, N.B., and in 1944 he was advanced to instrumentman. He was transferred to Edmundston, N.B., in 1947, where he remained until his recent promotion.

The following changes have occurred in the engineering department of the New York Central System: **G. W. Deblin,** assistant division engineer, Columbus, Ohio, transferred to the Michigan Central at Detroit, Mich.; **J. D. Frazer,** assistant division engineer, Bay City, Mich., transferred to Jackson, Mich.; **G. V. Coffey,** bridge and building supervisor, Jackson, promoted to assistant division engineer at Bay City; **H. L. Riser,** assistant engineer, Chicago, promoted to assistant division engineer at Columbus; **A. E. Kropp,** assistant supervisor of track, Elkhart, Ind., promoted to assistant engineer, Chicago; **F. P. Sparks,** fire protection engineer, Cincinnati, Ohio, promoted to bridge and building supervisor, Mattoon, Ill.; and **D. T. Southwick,** assistant engineer, Springfield, Ohio, promoted to fire protection engineer at Cincinnati.

Track

R. O. Beers has been appointed supervisor of track on the New York Central at Sandusky, Ohio, succeeding **J. A. Prybylski,** who has retired.

P. J. Spellman, section foreman on the Chicago & North Western at Sioux Rapids, Iowa, has been promoted to roadmaster at Chadron, Neb.

George Baerthlein, general track inspector on the New York Central, with headquarters in New York, retired recently after 41 years of service.

D. Dasti has been appointed acting roadmaster on the Capreol division of the Canadian National, with headquarters at Capreol, Ont., succeeding **A. J. Blanchard,** transferred.

L. E. Cox has been appointed roadmaster on the Chicago, Rock Island & Pacific at Pratt, Kan., to succeed **C. B. Murray,** who has been transferred to Iowa City, Iowa, replacing **C. S. Grimm,** transferred.

H. R. Dancy, roadmaster on the Canadian National at Smiths Falls, Ont., has been transferred to the Stratford division, at Stratford, Ont., succeeding **J. Billo,** who has been assigned to other duties because of ill health.

T. H. Masters has been appointed track supervisor on the Atchison, Topeka & Santa Fe, with headquarters at Woodward, Okla., succeeding **H. F. Curtis,** who has been promoted to roadmaster at Amarillo, Tex., in place of **F. B. Hart,** who has retired.

T. C. Ellis, whose promotion to general roadmaster on the Atlantic Coast Line, with headquarters at Rocky Mount, N.C., was announced in the

T. C. Ellis

February issue, was born at Valdosta, Ga., on August 20, 1896. He entered the service of the A.C.L. on August 2, 1921, as a laborer in the maintenance of way department and became foreman at Dunnellon, Fla., on November 6, 1927. He was promoted to roadmaster at Waycross, Ga., on May 20, 1941, and was transferred in this capacity to Troy, Ala., on January 1, 1942, and to Jessup, Ga., in January, 1945, remaining at the latter point until his recent promotion to general roadmaster.

C. V. Zeiss, roadmaster on the Chicago, Burlington & Quincy at Gillette, Wyo., has been transferred to Omaha, Neb., replacing **W. G. Kerst,** who has been appointed roadmaster at Alliance, Neb., succeeding **F. Carlson,** who has retired. **H. E. George,** roadmaster at Central City, Neb., succeeds Mr. Zeiss at Gillette.

John T. Hiner, track supervisor on the Southern, with headquarters at South Clarksville, Va., has been transferred to Greenwood, S.C., where he succeeds **Norman M. Cary,** who has been moved to Columbia, S.C., to replace **W. F. Poole. Lloyd O. Shealy,** track supervisor at Blackville, S.C., has been transferred to Chester, S.C., to replace **W. Burton Barber,** who succeeds **Hugh B. Cooper,** as supervisor at Batesburg, S.C. Mr. Cooper, in turn, has been moved to Blacksville to replace Mr. Shealy.

V. B. Siems, Jr., assistant supervisor of track on the Eastern division, of the Pennsylvania, with headquarters at Freedom, Pa., has been promoted to supervisor on the Williamsport division at Northumberland, Pa., succeeding **F. S. King,** who has been transferred to the Eastern division, at Mansfield, Ohio, to replace **C. H. Kooser,** whose promotion to assistant division engineer is noted elsewhere in these columns. **C. M. Noble,** general foreman on the Eastern division, has been promoted to assistant supervisor at Freedom, succeeding Mr. Siems.

Donald A. Sempsrott, whose promotion to supervisor of track on the Panhandle division of the Pennsylvania, with headquarters at Wheeling, W.Va., was announced in the January issue, was born at Cincinnati, Ohio, on November 2, 1919. He attended the University of Cincinnati and received the civil engineering degree in 1943. He first entered the service of the Pennsylvania during the summer of 1941, being assigned as a chainman on the Cincinnati division. He returned to railway service upon graduating from college in 1943 and was assigned, briefly, as assistant on the engineer corps on the Cincinnati division. From May, 1943, until August, 1946, Mr. Sempsrott was in the military service and on the latter date he returned to the Pennsylvania and was located at Greenville, Ill., on the St. Louis division. He was promoted to assistant supervisor of track on the Chicago Terminal division, with headquarters at Colehour, Ill., on January 1, 1947, and in June of that year was transferred to the Panhandle division, at Coshocton, Ohio, where he remained until his recent promotion.

Bridge and Building

Rush A. Kelso, whose promotion to bridge and building supervisor on the Southern, at Valdosta, Ga., was announced in the December issue, was born on November 12, 1913, at Brownsville, Tenn. He entered the service of the Southern as a student apprentice in the office of the chief engineer maintenance of way at Knoxville, Tenn., in August, 1942, and was appointed assistant supervisor at Knoxville in January, 1944. In February, 1944, he became track supervisor at Cochran, Ga., and, in June of that year, was transferred to Sheffield, Ala.; where he was located at the time of his recent promotion.

Carl L. Aurand, whose appointment as supervisor bridges and buildings of the Chicago & North Western, with headquarters at Boone, Iowa, was reported in the December issue, was born on November 8, 1899, at Monmouth, Iowa, and entered the service of the North Western in August, 1917, as a turntable operator at East Clinton, Ill. After serving with the U.S. Army from July, 1918, to May, 1920, he returned to the North Western as a bridge and building carpenter at Clinton, Iowa. Mr. Aurand subsequently served as assistant foreman bridges and buildings and foreman bridges and buildings until January, 1944, when he was promoted to assistant supervisor bridges and buildings at Fond du Lac, Wis., the position he was holding at the time of his recent appointment.

(*Please turn to page* 408)

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Railway Personnel (Cont'd)

Homer Mault, assistant bridge and building supervisor on the Michigan Central at Jackson, Mich., has been promoted to bridge and building supervisor at that point, succeeding **G. V. Coffey,** whose promotion to assistant division engineer is noted elsewhere in these columns. **A. B. Carr,** assistant engineer at Jackson, has been advanced to assistant bridge and building supervisor at that point to replace Mr. Mault.

Chester B. Collier, bridge and building supervisor on the Ohio division of the New York Central, with headquarters at Springfield, Ohio, retired recently after 47 years of service. **Charles L. Carr,** bridge and building supervisor of the Illinois division at Mattoon, Ill., has retired after 46 years of service.

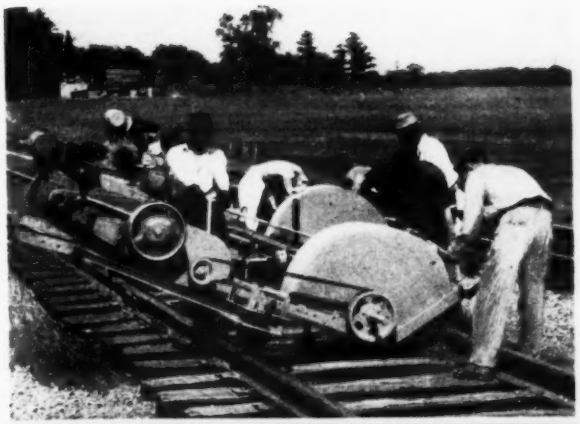
Wade Mitchell, assistant master carpenter on the Maryland division of the Pennsylvania, has been promoted to master carpenter at Harrington, Del., succeeding **T. F. Angus,** who has been transferred to Baltimore, Md., to replace **D. A. Leisher,** whose appointment as assistant engineer is reported elsewhere in these columns. **H. P. Johnson,** general foreman bridges and buildings on the Pittsburgh division, succeeds Mr. Mitchell.

E. D. Hedberg, whose promotion to bridge and building master of the Portage-Brandon division of the Canadian National, with headquarters at Fort Rouge, Man., was announced in the December issue, was born at Cloquet, Minn., on April 24, 1904 and entered the service of the C.N.R. as bridgeman on the Edson division on September 7, 1921, later serving as carpenter. On September 21, 1931, he was advanced to bridge and building foreman on the Edmonton division, in which capacity he served until December 1, 1946, when he was transferred to Edson, Alta. From November 1, 1947, until the time of his recent promotion, Mr. Hedberg held a number of special assignments in connection with flood repairs at various points on the line and also served as relief bridge and building master on the Edmonton division.

Water Service

C. L. Waterbury, supervisor fuel and water service on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, has been appointed engineer and superintendent fuel and water service, with the same headquarters. **P. E. Buettell,** assistant supervisor fuel and water service, has been promoted to assistant superintendent fuel and water service, with headquarters as before at Chicago, and **J. P. Crowley,** chief fuel inspector, has been appointed assistant superintendent fuel and water service at Butte, Mont. The positions formerly held by all of these men have been abolished.

(*Please turn to page* 410)



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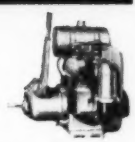
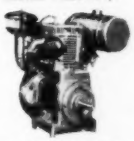
Shop maintenance is less, too, for a Wisconsin's long-term dependability stacks up with the ruggedness of the equipment it powers. A drop-forged crankshaft, heavy-duty pistons, rods, rings, and thrust-eliminating roller bearings at both ends of the crankshaft are other features that assure heavy-duty dependability.

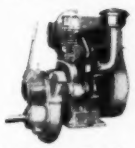
Everywhere in the field, you'll find Wisconsins, 2 to 30 hp. We invite your investigation.



2 to 6 hp. Models, Clutch Assembly.

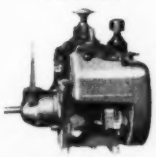


7½ hp. Standard.

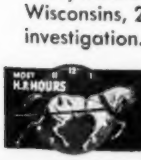


6 to 9 hp., Clutch-Reduction Assembly.

7 to 13 hp., Clutch Take-Off Assembly Power Unit.



15 to 25 hp., Clutch Assembly.



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Railway Personnel (Cont'd)

Special

Ray W. Keenan, supervising lumber and tie inspector on the New York Central, with headquarters at Cincinnati, Ohio, has retired after 43 years of service.

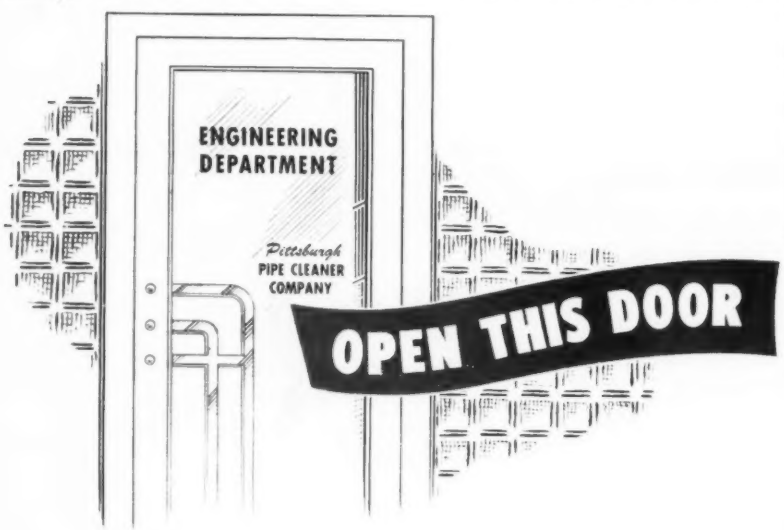
Obituary

William S. Reynolds, retired master carpenter on the Central Railroad of New Jersey, died of a heart attack at his home in Plainfield, N.J., on March 1. He was 84 years of age.

John C. Dorsey, division engineer of the Saratoga division of the Delaware & Hudson, with headquarters at Albany, N.Y., died in Memorial Hospital in that city on February 24 after a short illness.

George C. Jefferis, general manager of the Western Lines of the Atchison, Topeka & Santa Fe at Amarillo, Tex., and a former division engineer, died in Amarillo on February 21.

Glen H. Trout, who retired in 1945 as assistant chief engineer of the Union Pacific at Omaha, Neb., died in that city on March 11, following a heart attack. Mr. Trout, who was 69 years old, had 42 years of railroad service at the time of his retirement, 22 years of which were spent as system bridge engineer.



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Association News

Wood-Preservers' Association

Plans are completed for the forty-fifth annual meeting of the association, to be held at the Hotel Jefferson, St. Louis, Mo., April 26-28. The program portends another outstanding convention, with many technical reports and addresses of specific interest to railway men.

Metropolitan Maintenance of Way Club

The next meeting of the club will be held at 6:30 p.m., April 28, in the Skyline Room of the Hotel Sheraton, New York. Program arrangements for the meeting were not fully completed at the time of going to press. A feature of the meeting will be the election of officers for the coming year; the new officers will take office during the meeting. Standing committees for the year will be appointed as will the special committees to arrange the details of the annual outing to be held in June.

Bridge and Building Association

Taking advantage of the attendance of many of the officers of the association at the A.R.E.A. convention in Chicago, the Executive committee met at a luncheon meeting on Wednesday, March

Meetings and Conventions

American Railway Bridge and Building Association—Annual meeting, September 12-14, 1949, Hotel Stevens, Chicago. Elise LaChance, Secretary, 431 S. Dearborn street, Chicago 5.

American Railway Engineering Association—Annual Meeting, March 14-16, 1950, Chicago. W. S. Lacher, secretary, 59 E. Van Buren street, Chicago 5.

American Wood-Preservers' Association—Annual Convention April 26-28, 1949, St. Louis, Mo. H. L. Dawson, secretary-treasurer, 1429 Eye street, N.W., Washington 5, D.C.

Bridge and Building Supply Men's Association—E. C. Gunther, secretary, 122 S. Michigan avenue, Chicago 3.

Maintenance of Way Club of Chicago—Next meeting, April 25, 1949. E. C. Patterson, secretary-treasurer, Room 1512, 400 W. Madison street, Chicago 6.

Metropolitan Maintenance of Way Club—John S. Vreeland, secretary, 30 Church street, New York.

National Railway Appliance Association—R. B. Fisher, secretary, 1 No. LaSalle street, Chicago 4.

Railway Tie Association—Annual convention, September 12-14, 1949, Peabody Hotel, Memphis, Tenn. Roy M. Edmonds, secretary-treasurer, 610 Shell Building, St. Louis 3, Mo.

Roadmasters' and Maintenance of Way Association of America—Annual meeting, September 12-14, 1949, Hotel Stevens, Chicago. Elise LaChance, secretary, 431 S. Dearborn street, Chicago 5.

Track Supply Association—Lewis Thomas, secretary, 59 E. Van Buren street, Chicago 5.

16, to bring itself up to date on routine association matters and to lay preliminary plans for the annual convention of the association in Chicago, September 12-14. Early in March an issue of the B. & B. News was sent to all members, bringing them up to date on association matters, and urging early attention on their part to the matter of convention attendance.

Roadmaster's Association

The Executive committee of the association met in Chicago on March 14, taking advantage of the attendance of many of the members of the committee at the A.R.E.A. convention and N.R.A.A. exhibit in Chicago during the three following days. While routine association matters were given major consideration, there was a preliminary discussion of plans for the fall convention of the association, September 12-14, and further consideration to the membership drive now under way. An issue of the Roadmasters' News was sent to all members early in March, bringing them up to date on association matters and promising them an outstanding convention this fall.

American Railway Engineering Association

The Golden Anniversary meeting of the association was held at the Palmer House, Chicago, March 15-17. A highlight story of this meeting, including a list of the newly-elected officers, is given on pages 378 and 379 of this issue.

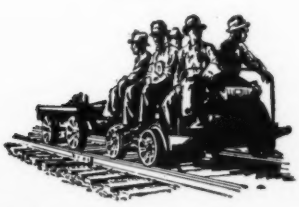
Only one technical committee has scheduled a meeting for April. This is the Committee on Track, which will meet at the Engineers' Club, Chicago, on April 27. On April 12, President Schwinn will meet with all committee chairmen at the association's headquarters at Chicago. The chairmen and members of the Board of Direction Committees on Outline of Work, Personnel of Committees, and Manual have also been invited to attend.

The bronze medallion paper weights commemorating the fiftieth anniversary of the Association are being mailed from the secretary's office as rapidly as possible, but it is not expected that this operation will be completed until about the middle of April.

Maintenance of Way Club of Chicago

The next meeting of the club—the annual meeting—will be held on April 25 in the Field Building, Clark & Adams Sts., beginning with a reception at 6:00 p.m., and dinner at 6:30 p.m. The feature of the meeting will be a thorough-

(*Continued on page* 412)



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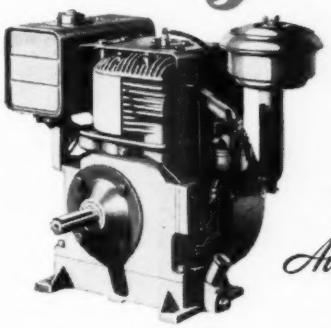

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Association News (Cont'd)

going discussion of the 5-day, 40-hr. week that will go into effect for maintenance-of-way employees September 1—and of how the railways can best meet the problems presented by this new work schedule. Supplementing the main speaker, who has not been selected as this issue goes to press, it is planned to invite general discussion of the problems by all roads represented at the meeting.

The March 28 meeting of the club was addressed by F. G. Campbell, chief engineer, E.J.& E., who reviewed the highlights of the many technical addresses and reports presented before the three-day, Golden Anniversary Convention of the American Railway Engineering Association, March 15-17, with particular emphasis on the addresses and reports dealing with the advantages of heavier rail, roadbed stabilization, and increased mechanization.

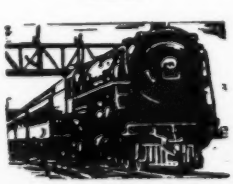
National Railway Appliances Association

In conjunction with the annual meeting of the American Railway Engineering Association at Chicago, March 15-17, the N.R.A.A. held an outstanding exhibit at the Coliseum. A total of 119 companies, occupying 243 booths, presented an exhibit covering a wide range of equipment, tools, appliances and material of interest to the engineering and maintenance forces of the railways. Elsewhere in this issue a two-page spread of photographs taken at random at the exhibit hall shows a few of the supply men and railway men present.

The exhibit this year was carried out under the general direction of Max K. Ruppert (P. & M. Co.), president of the N.R.A.A., R. B. Fisher (Buda Company), secretary, and Lewis Thomas (Q & C Co.), assistant secretary and director of exhibits.

At the annual meeting of the association, held at the Coliseum on March 15, H. M. McFarlane (O. F. Jordan Company) was elected president, Jess Mossgrove (Austin-Western Company) was elected vice-president, and W. H. Tudor (International Harvester Company) was elected treasurer. Mr. Fisher was re-elected secretary. W. B. Blix (Nordberg Manufacturing Company) and J. P. Kleinkort (Ramapo Ajax division, American Brake Shoe Company) were elected directors to serve for a term of three years. K. K. Cavins (Fairmont Railway Motors, Inc.) was elected a director for a term of two years, and Eugene Harbeck (National Lock Washer Company) was elected a director for a term of one year.

(*Please turn to page* 414)



Q AND C SWITCH POINT GUARDS WILL ELIMINATE DERAILMENTS AT YOUR SWITCHES

Q and C Manganese Switch Point Guards will guard against wear on Switch Points from either facing point or trailing movements and will prevent derailments caused by sharp wheel flanges climbing on worn points.

Order now to save renewal of Switch Points and stock rails.

Other Q and C Products:

Derails, Guard Rail Clamps, One-piece Manganese Guard Rails, Step Joints, Wheel Stops, Gauge Rods, Car Replacers, Snow Flangers and Plows, Skid Shoes, Anti-Slip Rail Tongs, Flangeway Brackets, Electric Snow Melters, Gauging Tools, Foot and Heel Guards.

CHICAGO — THE Q AND C CO. — NEW YORK — Serving Railroads Since 1886. — ST. LOUIS

THIS TRANSCONTINENTAL RAILROAD BOUGHT

NINETEEN BROWNINGS

IN THE LAST FOUR YEARS...OVER 100 SINCE 1906

THE new Browning M Series Locomotive Cranes are handling all types of heavy maintenance-of-way work for this class 1 railroad.

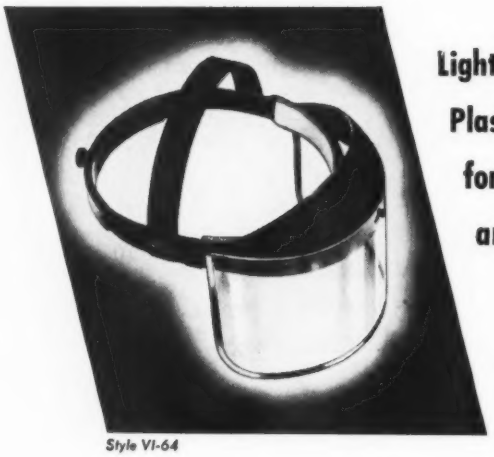
Bridge and roadway crews call for the Browning Diesels from all points on the transcontinental line—in fact it is hard to locate the Brownings from day to day.

Combining typical Browning ruggedness, long range mobility and easy operation the M Series Diesel has the versatility to handle clamshell, magnet, hookblock, piledriver and crane work on *your* job dependably and economically.

Bulletin No. 114718 describes new Browning features of design, construction and operation. Write for it today.

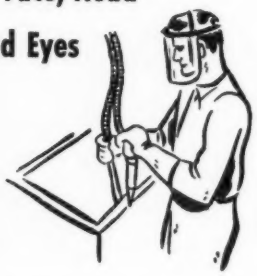
BROWNING LOCOMOTIVE, WAGON, TRUCK and TU-CONTROL *Cranes*

THE BROWNING CRANE & SHOVEL CO.
16224 Waterloo Road • Cleveland 10, Ohio



Style VI-64

Lightweight, Comfortable Plastic Protection for Face, Head and Eyes



If you want the fellows doing light grinding, wood working, spot welding to wear eye protection, give them WILLSON Protecto-Shields*. The large, one-piece visor—4", 6" or 8" long—provides both front and side protection. The adjustable, padded headband provides a snug comfortable fit. Workers wear them for long periods without fatigue. There's plenty of room for prescription glasses—and the visor swings up off the face when not in use.

VI Headgear small browguard

V3 Headgear large browguard

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest WILLSON distributor or write us direct.

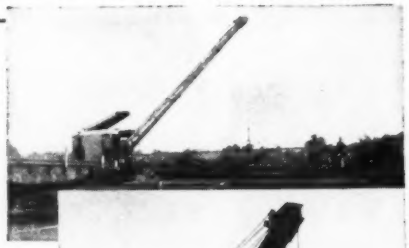
*T. M. Reg. U. S. Pat. Off.

WILLSON*

WILLSON PRODUCTS, INC., 243 WASHINGTON STREET • READING, PA.

LARGE or SMALL . . .

BURRO DOES EVERY JOB EFFICIENTLY, ECONOMICALLY



Whether the Burro is used to speed track laying or relocation, for bridge building, earth or ballast handling or on locomotive coaling jobs, it will handle every job more efficiently and economically—because Burro Cranes are built for railroad work.

Only* BURRO *cranes have:

- *Fast travel speeds—up to 22 M.P.H.*
- *Draw Bar Pull of 7500 lbs. (often eliminates need for work train or locomotive).*
- *Elevated Boom Heels for working over high sided gondolas.*
- *Short tail swing—will not foul adjoining track.*
- *Low overall height—Burro can be loaded and worked on a standard flat car (see illustration).*

Write for Bulletins

CULLEN-FRIESTEDT CO., 1301 S. Kilbourn Ave., Chicago 23, Illinois

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

Supply Trade News

General

The **Link-Belt Company** has moved its warehouse and district sales office in Spokane, Wash., to new and larger quarters at North 1303 Washington street, Spokane 13.

The **John S. Gray Company,** East Chicago, Ind., has been appointed distributor in the Chicago area for the **Browning Crane & Shovel Co.** as a result of the death of **Murray J. Blair,** as noted elsewhere in these columns.

The **Caterpillar Tractor Company,** Peoria, Ill., has begun construction of a new $150,000 parts depot at Indianapolis, Ind., to facilitate parts shipments to Caterpillar dealers and customers. Parts will be stocked for the firm's Diesel track-type and wheel-type tractors, Diesel engines, Diesel motor graders and earthmoving equipment. The new facility is Caterpillar's eighth parts depot, and will serve the sates of Indiana, Illinois, Wisconsin, Michigan, Iowa, Missouri, Kentucky, Ohio, Tennessee, Pennsylvania, West Virginia, Virginia and Maryland, and the Canadian provinces of Ontario and Quebec.

Layne & Bowler, Inc., Memphis, Tenn., and its sixteen affiliated well-water supply companies, have announced the latest addition to the Layne organization, the **General Filter Company,** Ames, Iowa. J. P. Lawlor, a former Layne engineer, who organized the General Filter Company in 1935, will remain in that capacity. This company is a concern of engineers and chemists devoted to the broad field of water conditioning.

Personal

Alfred I. Stuart has been appointed head of the methods engineering department of the **Hyster Company.** He will assume full charge of methods engineering for the company's plants at Portland, Ore., Danville, Ill., and Peoria.

R. B. Putman has been appointed general sales manager of the **American Lumber & Treating Co.** at Chicago.

J. H. Dooling, retired supervisor of track on the Boston & Maine, has joined the Tie Pad division of **Bird & Son,** East Walpole, Mass., as sales representative.

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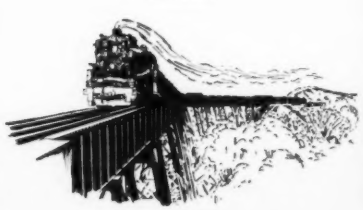
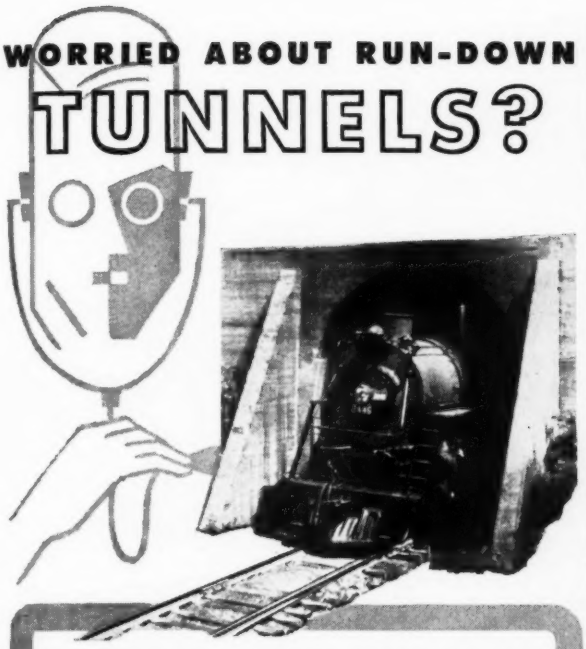


WORRIED ABOUT RUN-DOWN TUNNELS?



WESTERN'S PROVEN METHODS OF RESTORATION CAN HELP YOU

Rehabilitation of masonry structures—such as tunnels—can be accomplished most economically and most effectively through the specialized services of the Western Waterproofing Company. Recently this organization restored a seven hundred foot curved tunnel for one of the nation's largest railroads. The pictures, specifications, and detailed information on methods, materials and costs of this project will help in the analysis of your particular problem. Write today for specific details on how Western has saved thousands of dollars for railroads throughout the country. Want to see how they can do the same for you?

Railroads Specify Western for Service on:

STORAGE TANKS • TUNNELS
OFFICE BUILDINGS • BRIDGES
STATIONS • SHOPS • SOIL STABILIZATION

WESTERN

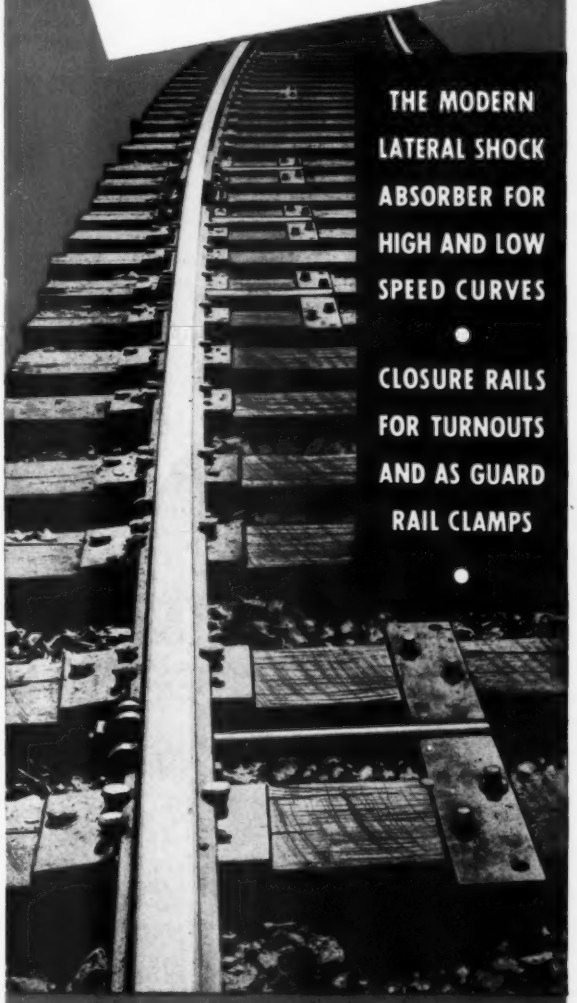
WATERPROOFING CO.
Engineers & Contractors
1225 Syndicate Trust Bldg., St. Louis 1, Mo.

No Materials For Sale — All Work Guaranteed
A Missouri Corporation

Please {send literature / contact me} regarding: ☐ Weatherproofing
☐ Waterproofing ☐ Concrete Restoration ☐ Tuckpointing
☐ Building Cleaning of.....
Property
Name.....Position.....
Railroad.....
Address.....
City.....State.....

● ELIMINATE RE-SPIKING AND RE-GAUGING, SIGNAL FAILURES, SPIKE-KILLING OF TIES WITH

MORRISON *Adjustable* RAIL HOLDERS



THE MODERN LATERAL SHOCK ABSORBER FOR HIGH AND LOW SPEED CURVES

●

CLOSURE RAILS FOR TURNOUTS AND AS GUARD RAIL CLAMPS

●

WRITE FOR FOLDER "B"

MORRISON
RAILWAY SUPPLY CORP.

FOSTER'S

Light-Weight
CORRUGATED
INTERLOCKING
STEEL-SHEET
PILING

SOLD UNDER THE
L. B. FOSTER CO.
WRITTEN
GUARANTEE

RAIL
TRACK ACCESSORIES
WIRE ROPE • PIPE

Rental-
PILE HAMMERS
EXTRACTORS

TRADE MARK

SINCE 1902

L. B. FOSTER
COMPANY

PITTSBURGH 30 NEW YORK 7
CHICAGO 4 HOUSTON 2

Five convenient warehouses
for prompt delivery

WRITE FOR FOLDER No. F-110-A

Supply Trade News (Cont'd)

W. M. Parrish, assistant sales manager, manufacturers' sales, industrial power division, **International Harvester Company,** has retired after more than 24 years of service with the company.

H. Neville Potter has been elected executive vice-president and general manager of the **Dearborn Chemical Company,** with headquarters at Toronto, Ont. Mr. Potter was appointed technical director of the company in 1945. **Arthur L. Johnson,** treasurer, with headquarters at Chicago, has been elected secretary-treasurer and a member of the board of directors.

Stanley M. Hunter, vice-president of sales, **American Hoist & Derrick Co.,** St. Paul, Minn., has been elected to the newly-created position of executive

Stanley M. Hunter

vice-president. Expanding business, states the company, has made it necessary to create the new managerial post. Mr. Hunter is a graduate of Albion College, Albion, Mich., and began his business career as an apprentice with the Novo Engine Company in 1919. He served as sales manager with that firm from 1925 to 1936, when he joined the sales department of American Hoist. He has served as vice-president of sales and a member of the board of directors since 1945.

The **Dearborn Chemical Company,** Chicago, has announced the appointment of **Earl M. Converse,** vice-president, to the post of senior vice-president, and the election of **Eugene P. Fager,** assistant vice-president and technical director, as vice-president and industrial department manager. Mr. Converse, who has been associated with Dearborn for 46 years, attended Armour Institute and Northwestern University. He served first in the firm's laboratory and moved to the sales department in 1906. He be-

Earl M. Converse

came director of the specialty department in 1917, a director of the company in 1929, and vice-president in 1934.

Mr. Fager is a graduate of the University of Illinois and joined Dearborn's laboratory staff in 1920. He advanced to chief chemist in 1924 and, in 1928, was

Eugene P. Fager

appointed sales department chemical engineer. Mr. Fager was elected a director in 1934 and assistant vice-president and technical director in 1941.

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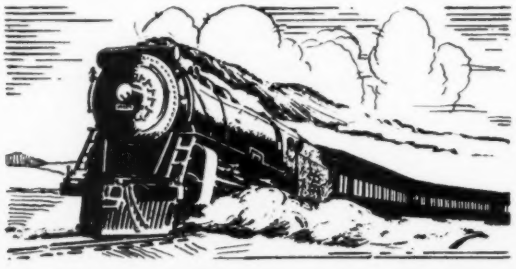


FASTEST WAY
to clear out trees

★ Weighs only 45 lbs. complete with 20" blade and chain
★ 5 models (20 to 60 in. blades) for trees to 5 feet in diameter
★ Full 5 hp... Chain is easily sharpened by hand filing
McCULLOCH

Save days of labor in clearing trees—limbing, felling, and bucking—by using McCulloch full-swivel chain saws.

The McCulloch, with the Rip-Cross chain will rapidly fell, rip, and buck any kind of wood. It's a *heavy-duty* saw that's really *light*. The McCulloch can go anywhere—in steep and rough country where heavy machinery would bog down.

MODERN TOOL FOR RAILROADS For tree maintenance, for road-building and bridge construction, and for clearing power-lines and right-of-ways, speed and efficiency result from the use of McCulloch saws. Send for detailed information.

McCULLOCH CHAIN SAWS

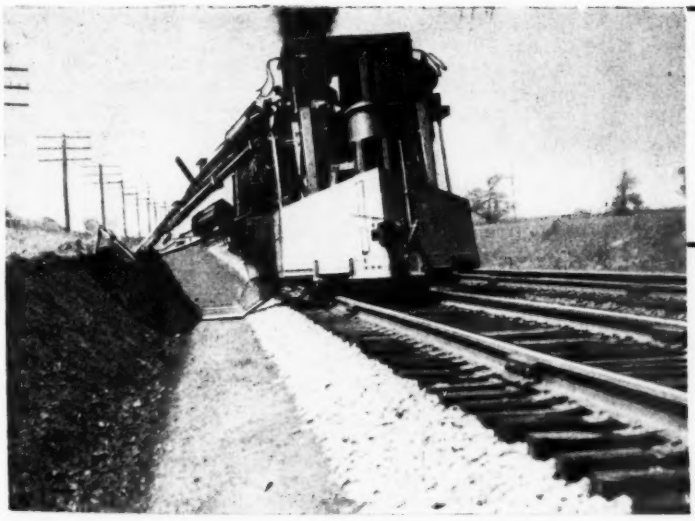
FELLS TREES CLOSE TO GROUND

SEND for detailed information

McCULLOCH MOTORS CORPORATION
6101 W. Century Blvd., Dept. MR
Los Angeles 45, Calif.

SPEEDS UP LIMBING

BUCKS ANY LOG QUICKLY



Send for the Jordan Book—contains 100 action photographs of the Jordan at work

IT'S TIME FOR THE JORDAN

For Spring maintenance work—reshaping ballast, clearing ditches, re-establishing the good drainage necessary for well conditioned track—there's nothing like the Jordan Spreader-Ditcher.

This "mechanical gang" does many essential jobs better than any other method—and does many more that other methods can't even attempt.

O. F. JORDAN COMPANY
WALTER J. RILEY, *President*
EAST CHICAGO, INDIANA

WARWOOD

JOB PROVEN FORGED TOOLS

Dependable tools are essential in aiding the maintenance of dependable train service. Warwood Track Tools are that kind of tools. Accurately forged and scientifically heat treated to meet A. R. E. A. specifications, they are designed for specific jobs. For high quality and longer service... use Warwood Track Tools.

PICKS . . . MAULS . . . WRENCHES
BARS . . . TONGS . . . SLEDGES . . .
ADZES . . . PUNCHES . . . CHISELS

WARWOOD SINCE 1854 FORGED TOOLS

Warwood Workmanship Makes The Difference!

WARWOOD TOOL COMPANY
WHEELING, WEST VIRGINIA

Supply Trade News (Cont'd)

Obituary

Murray J. Blair, distributor in Chicago for the Browning Crane & Shovel Co., died on February 14. Mr. Blair was born in 1880 at Mansfield, Ohio, where he began his business career with the Ohio Brass Company. In 1907 he joined the Browning Crane & Shovel Co. as chief electrician in charge of the power plant at Cleveland, Ohio. He left the plant in 1922 to represent the company as a salesman, and subsequently became district sales manager, with headquarters at Chicago. Mr. Blair later served as direct sales representative and was distributor in Chicago at the time of his death.

Trade Publications

(To obtain copies of the publications mentioned in these columns, use postcards, page 355)

Simplex Jacks—Templeton, Kenly & Co. has issued a four-page bulletin, designated as Industrial 49, containing specification charts, selection guides and price listings of all Simplex jacks and related equipment.

New C Tournapull—R. G. LeTourneau, Inc., has issued a folder, designated as TP-167, describing its new 150-hp. electric-control C Tournapull. The folder presents the specifications and design features of the machine and contains numerous photographs of the machine in action.

Standard Buildings by Luria—This is the title of a 20-page illustrated booklet published by the Luria Engineering Corporation, which presents the design features, specifications, and applications of the three standard types of Luria buildings, namely, the clear-span, rigid-frame type, available in widths ranging from 40 ft. to 100 ft.; center-column type, available in 50-ft. to 100-ft. widths; and the clear-span, rigid-frame type with crane runway, available for crane spans ranging from 40 ft. to 80 ft.

Tie Ties Tighter with Teco Clamping Plates—This is the title of a folder recently published by the Timber Engineering Company. It explains the use of two types of clamping plates for fastening ties and guard timbers on open-deck bridges and cites the experience of a large midwestern railroad which installed Teco clamping plates on one track of a double-track bridge to compare their performance with conventional lag-screw fastenings used on the other track.

Welded Bridges—The Air Reduction Sales Company has announced the availability of a new reprint, entitled Welded Bridges, which first appeared in The Welding Journal as an article written by LaMotte Grover, Airco welding engineer. This illustrated pamphlet offers a review of welded bridges constructed in this country and foreign countries during the last twelve years, practices in specifying steel material, details of design and methods of construction. Also included is a review of the results of some German fatigue tests of welded beams, of fatigue fractures in girders and stringers of riveted railway bridges, and of the repairs that are made by welding.

Industrial Fans—The Chelsea Fan & Blower Co., Inc., Irvington, N.J., has issued a six-page illustrated catalog listing the various types of industrial fans and blowers produced by this company. The catalog includes an illustration of each type of fan or blower, and lists the specifications of the various sizes of machines available in each type.

Underground Steam Distribution—Insulated Piping Systems—The Ric-Wil Company has published two new booklets containing data of interest and practical usefulness to those who are involved in problems pertaining to distribution systems of insulated piping. One of these, entitled Engineering Data for Underground Steam Distribution—Section 480-2, deals with such subjects as the layout of the route, methods of estimating steam loads, steam flow charts and tables, properties of steel pipe, properties of saturated steam, and other similar topics. The other booklet, Typical Engineering Drawings—Section 480-3, reproduces actual drawings used in a wide variety of insulated pipe installations.

"U.S." Builds Electric Plants for every railroad need

"U.S." builds a *complete* line . . . . compact Portable units to operate power tools and provide light for emergency maintenance of way . . . . larger units for work trains . . . . dependable units for stand-by service on bridges and signal systems. Gasoline and diesel powered — ½ to 140 kw, A.C. and D.C. Write for detailed specifications.

US

UNITED STATES MOTORS CORP.
438 NEBRASKA ST.
OSHKOSH, WISCONSIN

ELECTRIC PLANTS

BEALL Hi-Duty SPRING WASHERS are made especially to stand the strain of the heavy-duty rail service required by today's high-speed freight and passenger trains.

These washers are strong and tough, yet provide the necessary "springing action" required at rail joints, frogs and crossings.

We control every step of their manufacture—from the specification of the specially-developed formula and process used in making the steel to the forming, hardening, tempering and testing operations.

BEALL TOOL DIVISION *of Hubbard & Co.*
EAST ALTON, ILL.

Specialist Manufacturers of Spring Washers

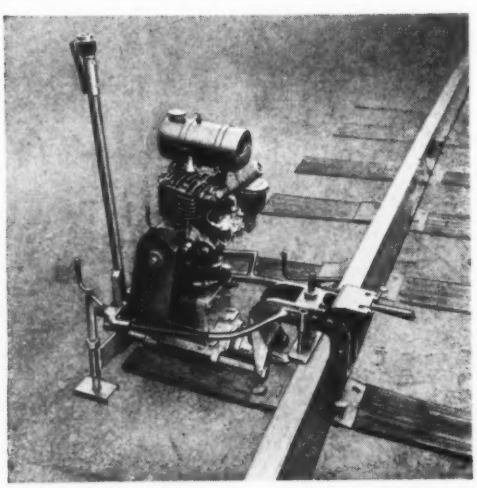
BEALL HI-DUTY SPRING WASHERS
MADE ESPECIALLY FOR RAILROAD SERVICE

SPEED
SIMPLICITY
ACCURACY

You Get All Three

with the

RTW Power Track Drill



This durable, easy to handle P-34A track drill, designed to speed rail maintenance at costs lower than ever before, will drill holes up to 1½" in less than a minute. Superbly balanced and light in weight, it can be attached to and removed quickly from the rail. A strong steel frame provides fast, accurate leveling with rail and uneven ground; adjusts easily to various rail sizes. Operation is simplified by lateral feeding of drill by ratchet gear and rack.

The P-34A is powered by a 1½ hp air-cooled gasoline engine. Drill is driven by a V-belt drive through an aluminum housed gear reduction assembly. Motor raises and lowers frame, and guards protect V-belts.

Send today for a bulletin on the P-34A and learn how it can appreciably reduce your track maintenance costs.

7714

Railway Trackwork Co.

3207 KENSINGTON AVE., PHILADELPHIA 34, PA.

AGENTS FOR

Kershaw-Railway Maintenance Equipment and Mark-Rite Paint Marker

FOR RAILROAD MEN—

COOL, PURE DRINKING WATER WHEREVER THEIR JOBS TAKE THEM

DOBBINS Portable Sanitary Drinking Fountain

Assures an adequate supply of cool, pure drinking water for maintenance crews, section hands, locomotive engineers. Protects their health and keeps them on the job. Fountain has inner water container of stainless steel. Four gallon tank is fully insulated. Constant air pressure for instant flow of water is furnished by a few strokes of the pump at widely spaced intervals. Operates *at the press of a button*, like any bubbler drinking fountain. May be carried easily from place to place by shoulder strap, or mounted on truck, tractor or locomotive. Prices on request.

DOBBINS MANUFACTURING CO.
Dept. 420 Ikhart, Indiana

SEND FOR COMPLETE INFORMATION *Free* FOLDER

Dobbins Superbilt PORTABLE DRINKING FOUNTAIN

SEALTITE HOOK BOLT

1 Fins prevent turning.
2 Fins seat without side pressure.
3 Drives easily.
4 Same size hole makes better installation.
5 Washer nut stops seepage and locks through nail hole.
6 Has reinforced hook.
7 Hook angle furnished to fit job.

***Double Life* SEALTITE HOOK BOLTS**

Because railroad trestles and bridges are constantly exposed to corrosive conditions we recommend the economy of ordering your hook bolts in the Sealtite Double-Life Hot-Dip galvanized finish sealing the bolt in zinc which retards all corrosion and saves expense of frequent replacement.

LEWIS BOLT & NUT CO.
504 Malcolm Ave. S. E., Minneapolis, Minn.

A *Greatly Improved* FASTENER

for maintaining crossings

A "10 TON ROLLER" THAT PAVES FLUSH TO RAILS

Heated Plate Hits 2000 Blows a Minute of 700 Lbs. Impact. Gives greater density than a big roller.

One man, with 230 lb. machine, super-tamps, finishes and cures 60 to 80 sq. ft. of patching in one minute — right up to rails or cushion strip — any hot or cold bituminous material, winter or summer. Ask for Bulletin 25-8 and name of distributor who will demonstrate.

WAYER IMPACTOR
SALES COMPANY
12 N. Third St., Columbus 15, Ohio

Now!

SIMPLEX JACK SUPPORTS OF ALUMINUM ALLOY *for* SAFETY, DURABILITY

Simplex Jack Supports and Simplex Aluminum Journal Jacks placed to raise bridge cap off of piling. Placing of Support and Jack requires only 3 minutes for two men.

Model JS-1
Height 15"
Platform Size 7"x10"
Weight 8¾ lbs.

Gain greater safety; reduce support replacement costs with these new Simplex Jack Supports made of sturdy, light weight aluminum alloy. Scientifically designed for proper weight distribution; far stronger than ordinary wedge supports; easy to set in place. With only four Jack Supports the heaviest structures can be handled safely... at the lowest possible cost.

SEND FOR BULLETIN BRIDGE 48

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

TEMPLETON, KENLY & COMPANY
1026 So. Central Ave., Chicago 44, Ill.

A RUGGED PAIR!

Correctly Applied
...that's the

VIKING ROTARY PUMP

The sturdiness built into the Viking rotary pump is well illustrated in the Viking rotor and idler above. Their wide tooth form and slow operating speed result in efficient operation, with long, dependable service.

This original "gear within a gear" design, most copied of all rotary pump principles, is the key to good pumping. Look to Viking for the correctly engineered pump for your job.

Send us your pumping problem today and ask for bulletin 49SY. Both problem and request will be given immediate attention without obligation to you.

See Our Catalog in SWEETS

Viking PUMP COMPANY
Cedar Falls, Iowa

You don't have to be BIG to be *EFFICIENT!*

847550

New UNLOADER-LOADER *Team For All Materials — All Sizes of Plants*

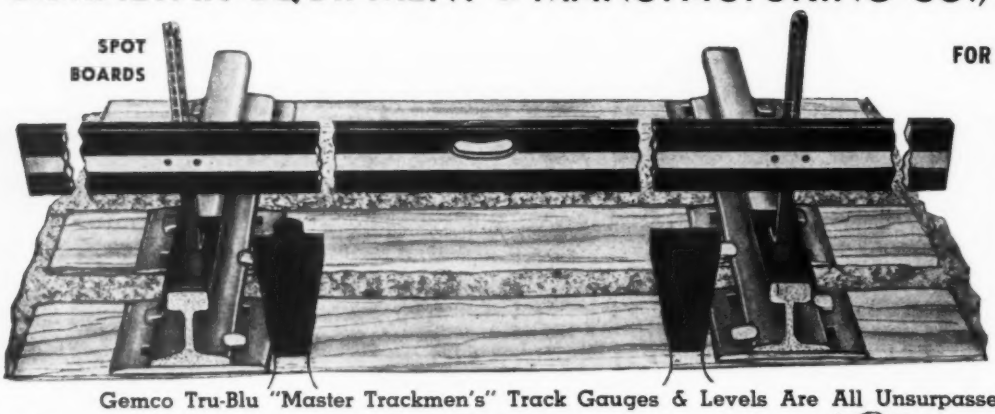
The new B-G 363 Unloader-Stockpiler-Loader is an all-purpose machine; handles all bulk materials—up to 200 T.P.H. Also handles bagged and packaged goods. All new, heavy duty, highly portable! The 358 Hopper Car Unloader clears a car of material in 45 minutes! Positive, non-slip hopper-bottom car unloading for all bulk materials. Easy to spot over rails or in pits. Truck-towed portability.

Send for new Bulletins! On the 24" Belt Conveyor, Bulletin 363. On the Hopper Car Unloader, Bulletin 358. Address

Barber-Greene Company
Aurora, Illinois

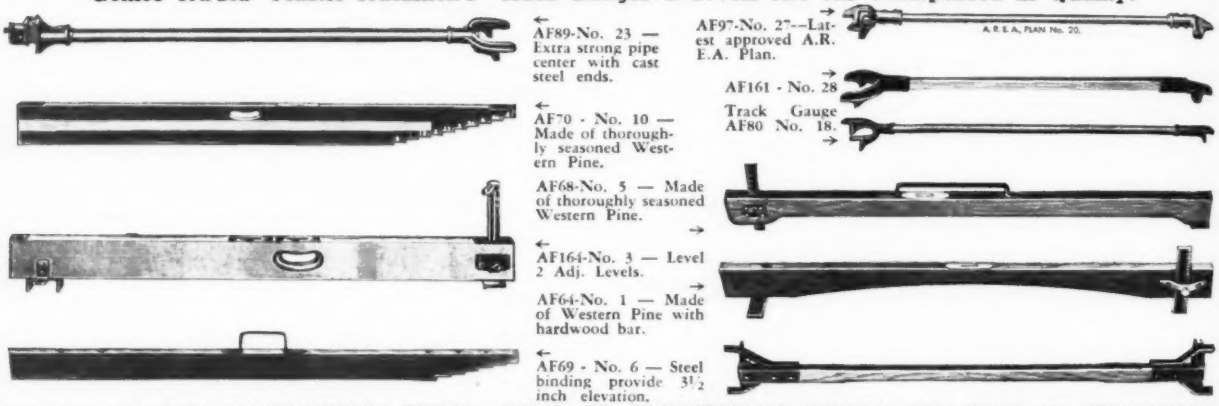
"GEMCO TRU-BLU TOOLS". BEST TRACK TOOLS FOR TOP TONNAGE TRANSPORTATION! MADE BY:

GIBRALTAR EQUIPMENT & MANUFACTURING CO., ALTON, ILL.



HEADQUARTERS
FOR GEMCO TRU-BLU
"MASTER TRACKMEN'S" TRACK TOOLS MADE TO YOUR OWN PLANS. ALSO ALL STANDARD ITEMS — CAR MOVERS, GAUGES, BENDERS, RAIL CARS, LEVELS, TIE TONGS, RAIL DRILLS, CAR-STOPS, DERAILS, LEVELERS, GREASE GUNS, ETC.

Gemco Tru-Blu "Master Trackmen's" Track Gauges & Levels Are All Unsurpassed in Quality!



← AF89-No. 23 — Extra strong pipe center with cast steel ends.

← AF70 - No. 10 — Made of thoroughly seasoned Western Pine.

AF68-No. 5 — Made of thoroughly seasoned Western Pine.

← AF164-No. 3 — Level 2 Adj. Levels.

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← AF69 - No. 6 — Steel binding provide 3½ inch elevation.

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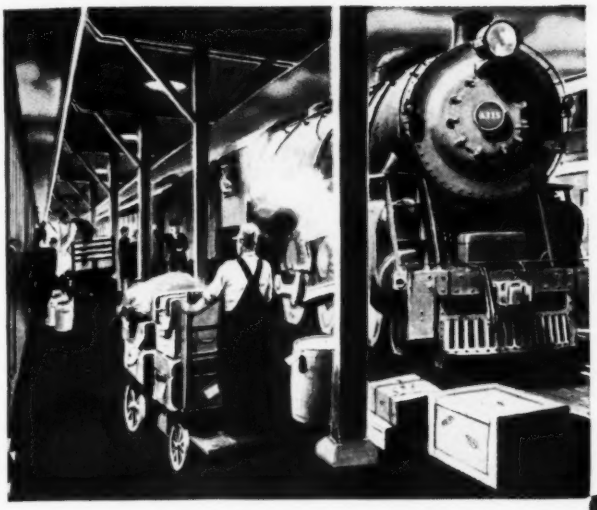

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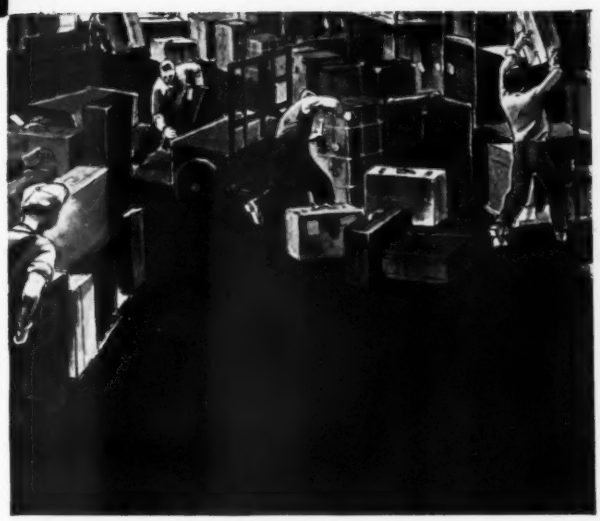

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